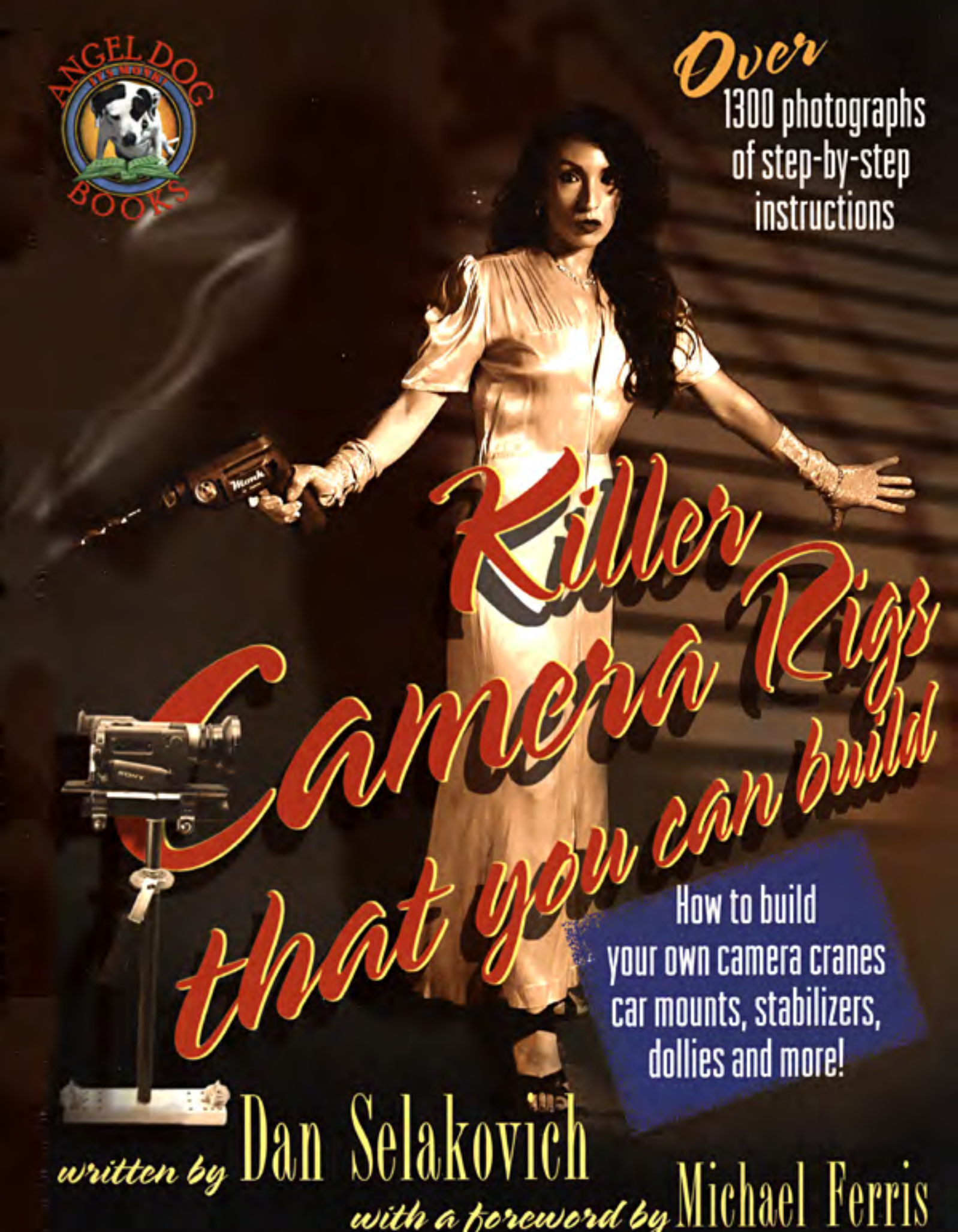

ANGEL DOG BOOKS
Over
1300 photographs
of step-by-step
instructions
Killer
Camera Rigs
that you can build
How to build
your own camera cranes
car mounts, stabilizers,
dollies and more!
written by Dan Selakovich
with a foreword by Michael Ferris

KILLER CAMERA RIGS THAT YOU CAN BUILD

HOW TO BUILD YOUR OWN DOLLIES, CRANES, STABILIZERS, CAR MOUNTS AND MORE

BY DAN SELAKOVICH



ANGEL DOG BOOKS
LOS ANGELES, CALIFORNIA

Killer Camera Rigs That You Can Build
How to build your own dollies, cranes, stabilizers, car mounts and more

By Dan Selakovich

Angel Dog Entertainment
137 N. Larchmont Blvd. #449
Los Angeles, CA 90004

Web Site: www.dvcamerarigs.com

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For Dad.
After putting up with a dirty garage for my entire childhood

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You know what this one's about.

About Michael Ferris

Hey, Dan, why would you get someone nobody's ever heard of to write your foreword? Who the heck is Michael Ferris, anyway?

Yes, I was asked that. Fact is, Mike is a quite famous cinematographer in certain circles. Besides, even the most removed from the film industry have seen his work. Maybe you've seen these little, lesser known films: Die Hard, Water World, End of Days, Point of No Return, Internal Affairs, Back To the Future part II, Colors, Never Say Never Again...I could go on and on. His credit list is as long as my arm. Yep, he knows his stuff. There isn't a piece of film making equipment he hasn't had is hands on. A pretty good person to write a forward on film equipment, don't you think?

But the main reason for asking him to write the foreword is his long collaboration with John Cassavetes. Cassavetes is arguably the father of American Independent film. (I saw Shadows 15 years after its release, and it still haunts me as a film to aspire to in my own work, but I know I'll never be that good). It's the independent filmmaker I wrote this book for. Now we don't have to compromise a shot because we couldn't afford to rent that crane--or dolly or car mount or stabilizer—now we can own these things and have them handy whenever the filmmaking mood strikes us. I can't know this for sure, but I'd like to think John would have loved a book like this. Instead of spending $500 dollars on dolly rental, he could have bought more film. And after hearing some of Mike's marvelous stories about his work with Cassavetes, there was almost a perpetual lack of the stuff.

I met Mike Ferris through a mutual friend, Bo Harwood (another long time Cassavetes collaborator). I have to tell you about that first meeting: it was at a convention here in Los Angeles where film manufacturers and suppliers show their wares. Bo and I met Mike at the front entrance, and before we made it 100 feet into the place, Mike had three job offers on three major motion pictures from friends and co-workers that happened to be at the convention (it seems that Mike knows everyone!) I'm not kidding: three offers of work inside of 10 minutes! Well, I was floored. Quite the first impression.

So that's why I asked Mike. Any more stupid questions?

Foreword by Michael Ferris

When Dan Selakovich asked me to write the introduction to a book about equipment and the technology of filmmaking, I asked him, "Why me?"

We had met but a few times and I was able to think readily of many who had more aptitude regarding the subject other than myself.

It is true that I have spent many years using the technological marvels available to the modern filmmaker. During this time it has been my job to relate the desires and instincts of many to the where, how, and when to use this sophisticated machinery. Still, I thought, am I justified in writing a forward to a book dedicated solely to the technology of filmmaking?

Then Dan answered my question. And with his answer he made me understand instantly the yes of my own qualifications. He said, "Mike, you've worked with John Cassavetes. The man that started true independent film, the man that opened the door for the rest of us. And that's what this book is truly about, not just building camera rigs, but being free to create without a studio budget."

I worked with John Cassavetes through the seventies and knew him until his death in February of 1989. I worked with him as cameraman on, A Woman Under the Influence, The Killing of a Chinese Bookie, Mikey and Nicky, and Opening Night. I also worked on a film written by John and directed by his son Nick; She's So Lovely, (original title: She's De Lovely).

The man who authored this meticulous book was clearly inspired by John Cassavetes. It is a work of determined imagination, requiring perseverance and sacrifice, both common ingredients in any film John ever attempted.

As John's work continues to inspire people everywhere Dan Selakovich has used his experience to reduce the disparity between affordable and high cost filmmaking. This is something I think John would have deeply appreciated.

The difference between John and others was the difference between personal and professional lives. The clearly defined demarcation between work behavior and our private selves didn't exist for John. Where most of us leave our homes, arrive at work, and assume a public attitude, John shot his movies in his home. He used family and friends to play out the parts he wrote and cajoled everyone in his life to help him render his ideas onto film. He was able to do this so successfully because he possessed the rarest combination of original talent and extraordinary personal humanity.

How does all this apply to to the equipment used to make films?

In John's early days of picture making his camera platform and dolly moves were essentially limited to what his shoulders, legs and back could withstand. His budgets limited the equipment he used. There is no question he would have enthusiastically incorporated into his projects the simple, useful techniques found in these pages. I can imagine him talking to Dan for hours (as he did with many of us) about the building and use of gear in this book for scripts he had written.

The singular beauty of this book is that Mr. Selakovich has successfully dedicated himself to producing clarity with every page. All aspects of creating the equipment it describes has been worked out in detail. The difficulties associated with visualizing specific construction and the agonies of realizing mistakes, then re-measuring and rebuilding are gone. Anyone who desires can quickly render easily obtained, inexpensive hardware into practical, reliable, innovative filmmaking equipment. This in turn will allow greater creativity for stories less restricted by physical limitations or time constraints.

I commend Dan for his pioneering solutions to the technical dilemmas facing filmmakers. I further salute you, the reader, for caring to search for ways to overcome the many obstacles to communication that bedevil those who would entertain, illuminate, inform or connect with the human heart.

Like John Cassavetes, who seemed to reinvent the camera to interpret his own values, who recognized no technical boundaries and generated a visual language born out of pure stubborn necessity, declare war on anything that says the filmmaker can't.

This book not only says you can...it shows you how.

Michael Ferris
Malibu, California

Introduction

Thank God for the DV revolution. It has put filmmaking within reach of us poor folk (relatively speaking). The downside is that the things that hold and move the camera–dollies, stabilizers, cranes, and other necessities of movie making are still darned expensive to rent. And forget purchasing. (I don't know about you, but a grand for a boom arm is a little beyond my means). This book will change all that. I'm going to show you how to make this stuff. It really isn't hard. For the most part, if you can drill a hole, you can make most of the equipment in these pages. Really. And you don't even need a lot of room (I built everything in here in my apartment kitchen). I've also tried to make the gear with the bits and pieces that are readily available at your local hardware store or sporting goods shop.
The other great thing about DV cameras is their size. They're small and light. Which means your camera rigs can be small as well (The Dark Passage Dolly has been used to do a dolly shot in the back seat of a car. Let's see Hollywood to that!). Smaller rigs means more innovative shots in less time.

Most of the rigs in this book can be built for less than $50. As long as you follow my instructions! In other words, I've already made the costly mistakes for you. Not to mention the time wasted for that 100th trip back to the hardware store. Trust me, the price of this book will be saved in trial and error when you build your first crane. You may also notice that I use aluminum quite a bit in these rigs. Please don't panic! I know it's a metal, but it's a very soft one and relatively easy to work with. So don't worry, we'll be doing this step-by-step, and it's easy.

What you need to know before building anything in this book

Tools

Have you ever seen this really great show called The New Yankee Workshop? It's a PBS spin-off of This Old House. In it, Master Carpenter Norm Abram shows us how to build all sorts of finely crafted furniture and a plethora of other wood projects. The only bad part of the show is his amazing power tool collection.

Often I'll watch Norm work on a piece of equipment that only someone with a weekly show could afford; "Now we'll just move over to our laser cutter and glue unit..."
Laser cutter? Glue unit? Dang, Norm, it's just a coffee table. And where do I get one of those laser cutters combo glue units?
You won't have that frustration in this book. While you'll need some basic tools for these projects, I will give you cheaper options than the best option. Would it be nice to have a drill press? Yes. Do you absolutely need it? No.
So at the beginning of each project there will be a tools list of what you'll need to make it.

Materials

As I mentioned earlier, I've gone to some great (and sometimes very frustrating lengths!) to build these rigs out of materials you can find in just about any city in America. Like the tools, there will be a list of the materials you'll need at the beginning of each proj-

ect. And there is also a "Photo Shopping List" that has pictures and measurements of what you'll need, along with handy boxes to check once you've put the thing in your cart. Don't know what a lock nut is? Just look at the photo. Easy. Also, read through the **entire project** before heading to the hardware store. There are things that are left up to you that take some consideration. For example, if you're getting a different size bolt than what I'm using, you just might need a different size drill bit to match that bolt.

While we're on the subject of buying, I found that the weird little out-of-the-way hardware stores were best for finding a lot of the little odd things. As far as the big chain home centers go, **Home Depot** was good for only the most common materials. **Orchard Supply Hardware, Ace** and **Lowes** have a much greater selection of odd and ends, at least in the Los Angeles area.

"Make It Groovy" Options

Many of the projects you'll make have what I'll call a basic construction, and then add-ons to make it really cool. For instance, the Big Combo Crane basic camera mount is non-movable. The **Make It Groovy** option adds a movable bracket so you can tilt the camera up or down.

READ THIS OR GO BLIND!

Please, please read the safety instructions that come with your power tools– **AND FOLLOW THEM!** And make damn sure you buy some safety glasses. All it takes is one metal chip in your eye to end your filmmaking career.

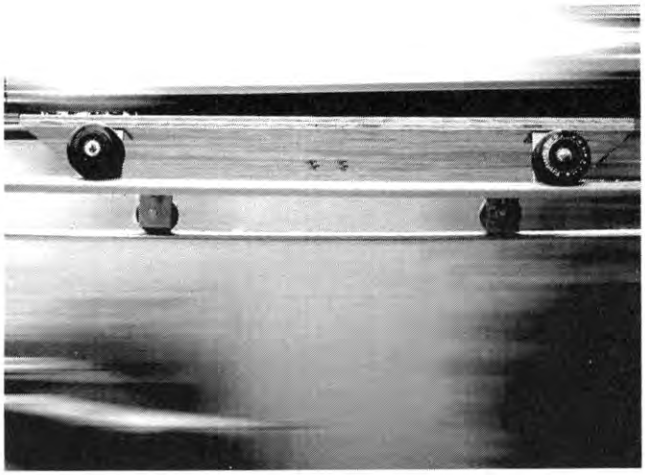
YOU CAN'T MAKE MOVIES IF YOU'RE BLIND! SERIOUSLY, DON'T BE STUPID. BUY AND WEAR THE DAMN GLASSES.

Legal Stuff

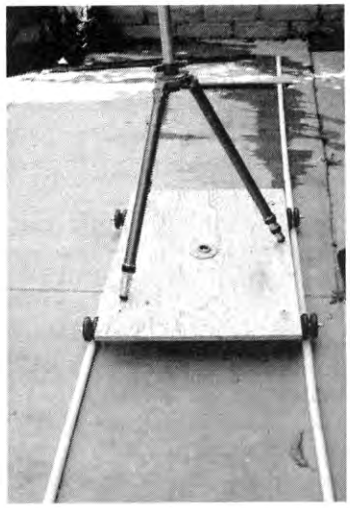
The designs in this book are for private use only. The rigs in this book are patented by my self or others, and each plan is copyrighted, so using the plans to build rigs for sale or rental is strictly illegal, forbidden, and quite frankly, a really crappy thing to do after I've gone to all of this work. To be clear: can you build the rigs in this book for your own use? Absolutely. Can you build 10 stabilizers and sell them to your friends? **ABSOLUTELY NOT!** Well, can you make copies of any of the plans and pass them around or sell them? **NO. NO. NO. Geez, make your friends buy their own stuff!**

And one more thing: Build and use these rigs at your own risk. If you make a rig and it comes crashing down on Aunt Zelda, we here at Angel Dog can't be held accountable.

THE DARK PASSAGE DOLLY

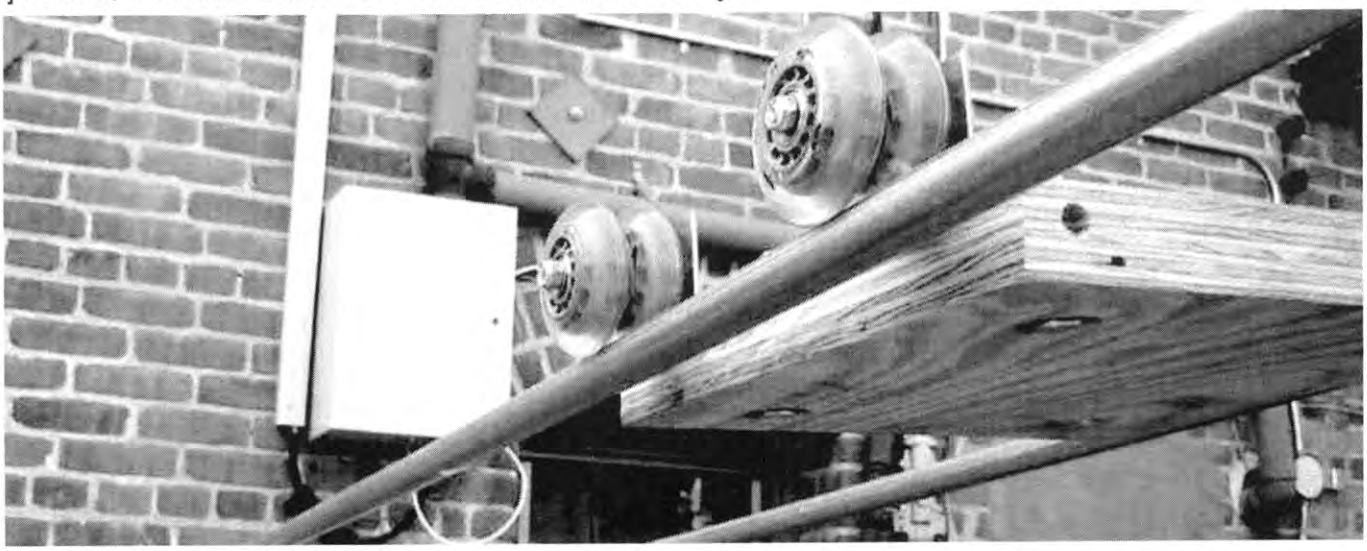






The great thing about this dolly is its versatility. By making the dolly platform any size you choose (within reason, of course), you can adapt it for any situation for the price of a piece of plywood. And because of the unique wheel design and placement, this dolly can be mounted to run on rails overhead! And once your wheel **assemblies** are made, you can just move them from one size plywood to the other. No need to spend a lot of cash on extra wheels!

The plans for the **Killer's Kiss Crane** elsewhere in this book makes it a perfect combination for use with this dolly.

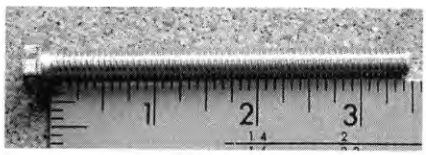


As I mentioned in the introduction, you'll find a materials shopping list complete with photos. There are even little squares by each item so you can check it off when you find it. There is also a list of tools you'll need for the project. Let's get started.

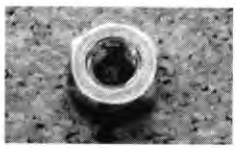
THE DARK PASSAGE DOLLY MATERIALS LIST



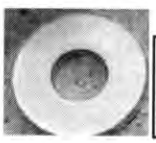
(8) in-line skate wheels. It doesn't matter what size, just as long as they're on sale! (make sure they have the bearings, or pick some up in a separate pack. **Each wheel takes 2 bearings, so that's 16 in all.** If you live in L.A., get these in the toy district downtown. Much cheaper. You'll also need some if you're building the "Shock Corridor Stabilizer"). ☐



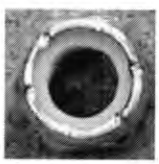
(4) 5/16" bolt x 3 inches long. This goes through the wheel bearing, so make sure it's a snug fit. (all the skate bearings are 5/16"). ☐



(8) 5/16" nuts. Try to find nuts that are thinner than average. They're called **JAM** nuts. ☐



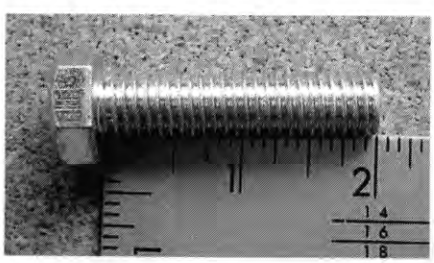
(8) 5/16" Washers. They don't have to have an exactly 5/16" hole, but pretty close to the bolt diameter. ☐



(4) 5/16" Lock nuts. Lock nuts have this little nylon ring that holds it tight to the bolt--important! ☐



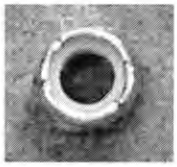
(4) L-brackets. You won't find these with the rest of the L-brackets. These are made for deck building by Simpson Strong tie, so check that part of the hardware store first. They are really heavy duty and take a 1/2" bolt. (See below) ☐



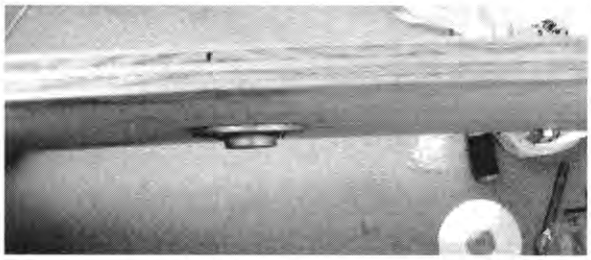
(4) 1/2" bolts x 2 inches long. These hold the wheel assembly to the deck of the dolly. ☐



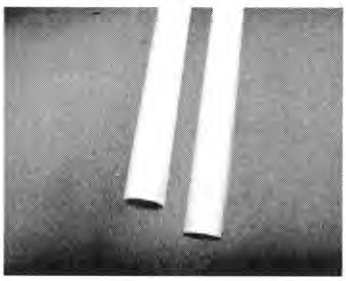
(8) 1/2" I.D. (Inner Diameter) or larger washers (for the half inch bolt).



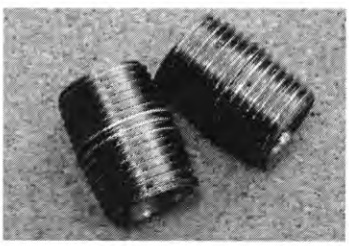
(4) 1/2" Lock nuts (for the half inch bolt).



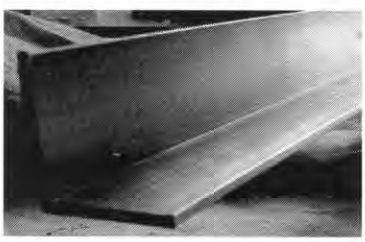
3/4" thick plywood. This can be any size up to about 2'x3' depending on your needs. I have several sizes. I use a 12 inch square a lot in tight places.



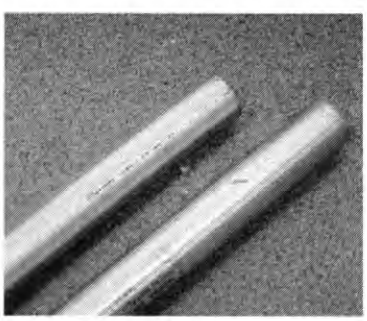
3/4" PVC pipe. You'll find this in the plumbing section. This is used for dolly track. You can use other stuff for track depending on the situation. This stuff is good for work on the floor. Get as much as you need. (4) 10' lengths is a good start.



1/2" metal pipe nipples (Get 1 for every 2 sections of PVC pipe). These are good for screwing the PVC pipe together for longer sections of track.



Long lengths of L shaped aluminum is a good **option** for dolly track where you might need a lot of strength (going over-head between 2 ladders, for instance).



Another option for dolly track is 3/4" electrical conduit. It comes in 10' lengths, but is difficult to string together so you don't get a bump in your camera move. I'd use it for shots of 10' or less.

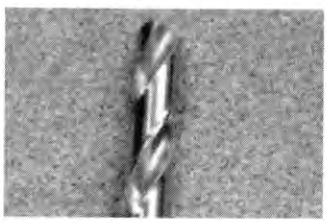
DARK PASSAGE DOLLY TOOLS LIST



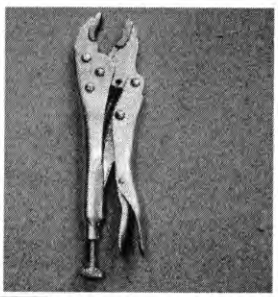
You probably already have most of this stuff, but lets make sure.



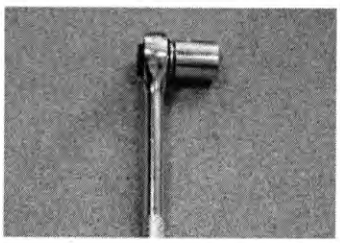
A drill. Get one with "variable speed" ability. ☐



1/2" drill bit ☐



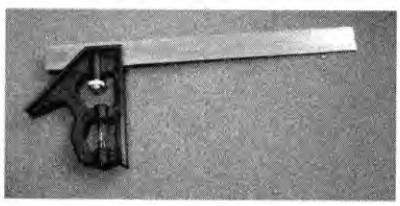
Locking pliers. Get two, you won't be sorry. ☐



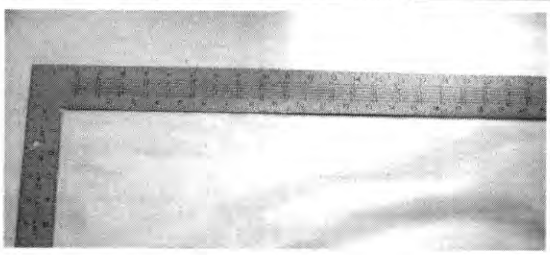
A socket wrench set. Not absolutely necessary, but damned handy. ☐



An assortment of clamps. Not so necessary on this project, but always handy, and very much needed on other projects in this book. ☐



Combination square. Get one, get one, get one. ☐

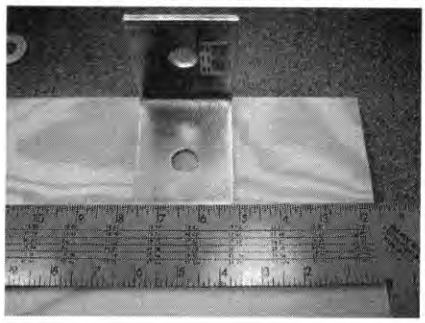


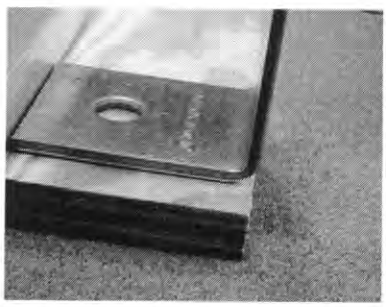
A Big Framing square. For this and other projects! ☐

Let's build it

First, we need to figure out where to put our brackets for the wheels. The plywood I'm using for this dolly measures 3'x2', plenty big enough to hold a tripod or small boom arm. 5" from the edge seems about right. Use the framing square to make sure the placement of the bracket is square with the deck, and right on the edge of the board. If we were using a smaller piece of wood for the platform, we might want to only go in a couple of inches.

1.





As you can see, I'm placing the bracket flush to the edge. **IMPORTANT: make sure all of the brackets are lined up the same, or they won't fit into the track properly!**



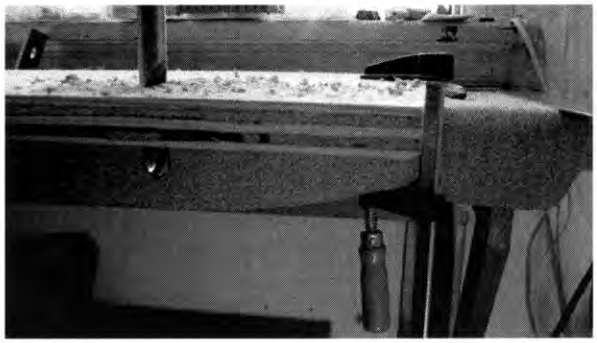
Here I'm using a piece of aluminum that runs the full length of the board as a straight edge against my framing square so I know where to place the bracket on the other end. It might be a good idea to draw a pencil line down the length of the straight edge and line both brackets against that line.



Once the Bracket is in place, mark the center of the hole in the bracket. This is where we'll being drilling in to our deck to attach the bracket. Do this in each corner with the remaining 3 brackets.

In this photo, I'm using a bracket with 2 holes on a much smaller platform, but the principle is the same.

2.



Let's do some drilling. Clamp the board to the table and load that big 1/2" bit in to the drill. Be careful to drill the hole right on that perfect mark you made! Do this to the remaining 3 corners.

3.



Attaching the Brackets

You're going to need that 1/2" bolt, 2 washers, and a lock nut (the one with the little nylon ring inside).

This is pretty straight forward. Put a washer on the bolt and stick the thing up through the hole. (The head of the bolt should be on the top side of the dolly.)

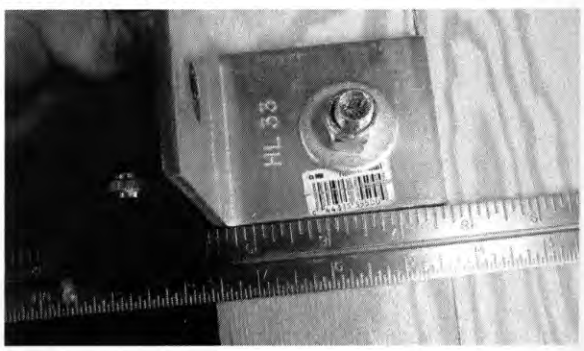
Thread the bracket hole over the bolt, then a washer on top of that, then tighten the whole she-bang down with the lock nut.



Before you tighten that nut all the way down, grab your combo square (you did remember to get one, didn't you?) and line it up with one edge against the plywood, and the other against the edge of the bracket. Is the bracket square against the straight edge? If not, and it probably won't be, just muscle it over until it looks like this:

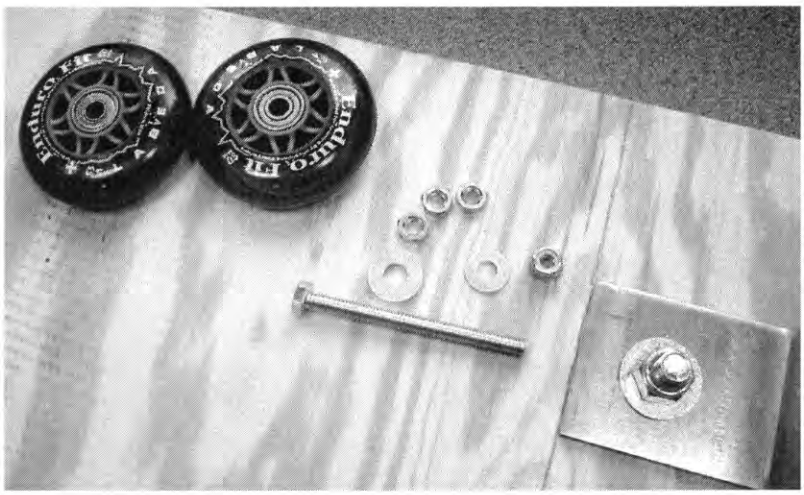


Combo Square



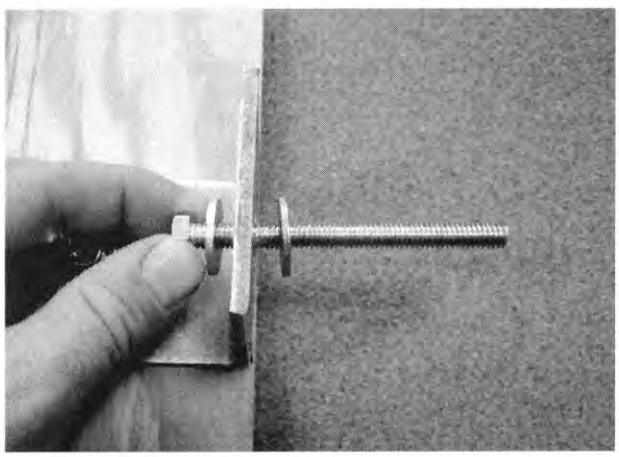
Now tighten the pajeezus out of it. Finish up the other 3 corners.

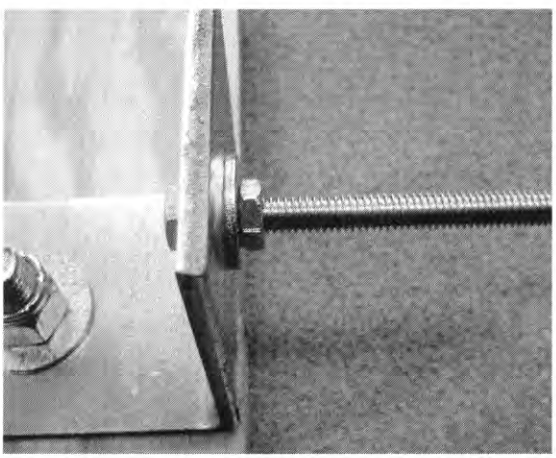
Attaching the Wheels



Hey, we're almost done. Pretty easy so far, huh?
Grab your 5/16" x 3 inch bolt, 2 jam nuts, 2 washers, 1 locknut and 2 skate wheels with the bearings.

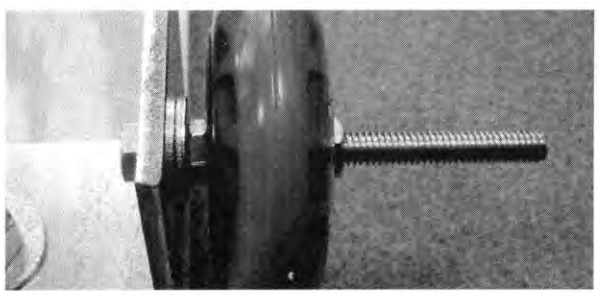
1. Put a washer on the bolt and run it through the hole in the bracket and put a washer on the other side (See, like in the picture.)



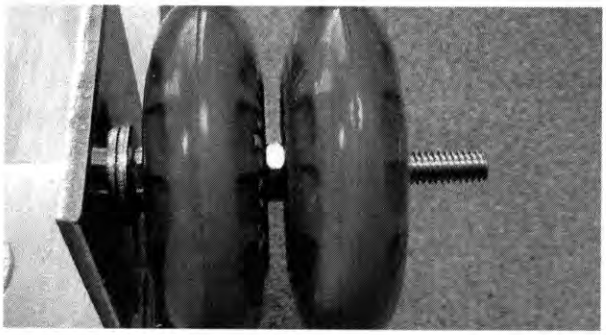


2 Screw one of those narrow nuts on and tighten the hole mess down. Hey, look at that! You just made an axle!
(Make sure you put the bolt at the top of the too big bracket hole--toward the deck--to keep it from sliding. Also, it looks like there are 2 washers. Nope. Just a reflection)

3. Put on one of your wheels and thread another nut on the other side. Not too tight, you still want the wheel to spin without being wobbly.



4.



Slide the second wheel on add a washer and screw on that lock nut. Again, not too tight. There.



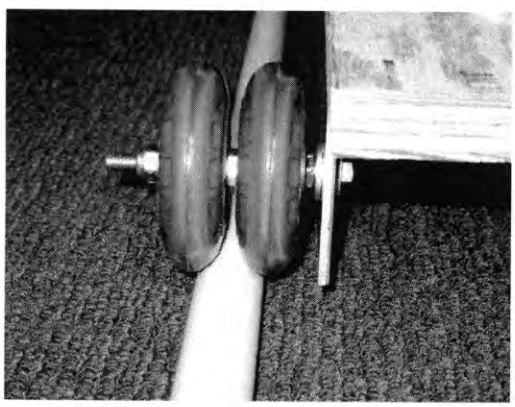
Repeat the steps on the other 3 brackets and you're done. If your bolt is too long, chop it off with a hacksaw.



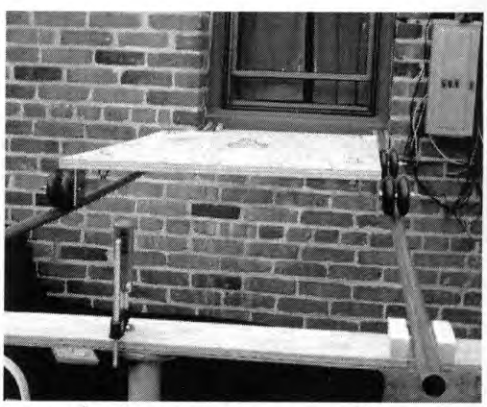
Here's what the bottom should look like when you're done.



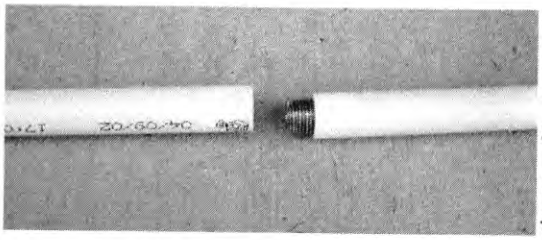
Here's a small version with a fluid head bolted to the middle.



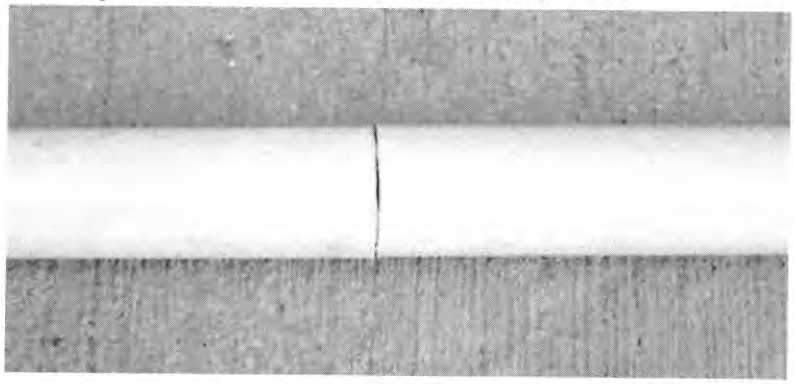
When you place the finished rig on the track, make sure it fits in the groove in-between the two wheels.



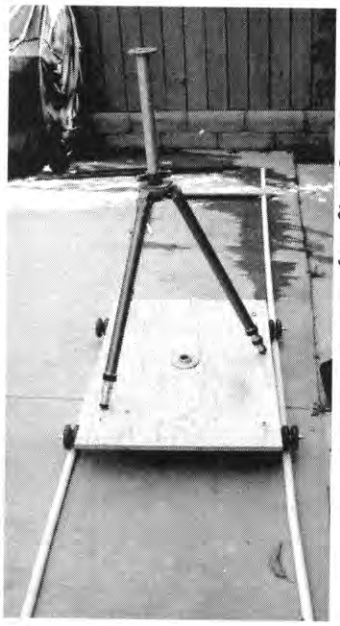
Here's the dolly up off the ground using electrical conduit for track.



Remember the 1/2" pipe nipples you bought? Here's what they're for: Take your 3/4" PVC and screw the nipple in. You'll basically be making your own threads as you screw the thing half way in. Then screw the other PVC on to the other half of the nipple. You just turned 10' of track into 20'.



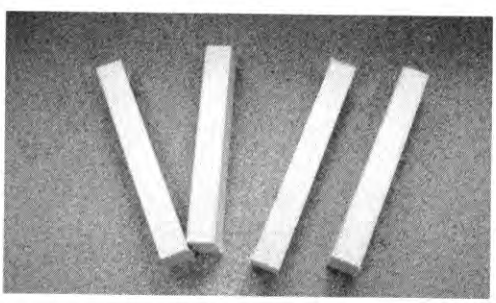
After a while the PVC will become worn and not hold the nipple any more. Just cut an inch off the PVC and start over. Simple!



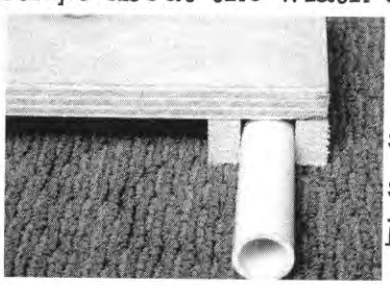
OK, let's make a little jig to keep the track spaced correctly for your dolly wheels.



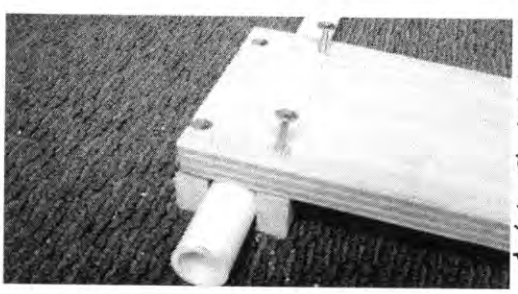
First, get a piece of wood that will span the tracks by at least a couple of inches with your dolly sitting on it.



Then cut four strips about the width of the board.

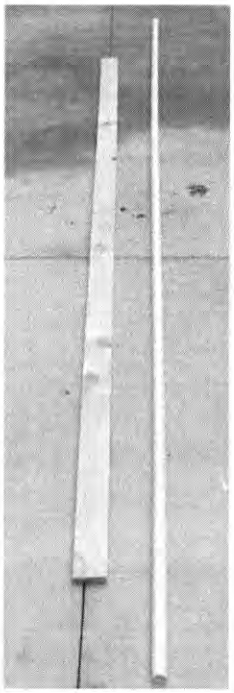


Set the strips on each side of the track and screw them in to the board.

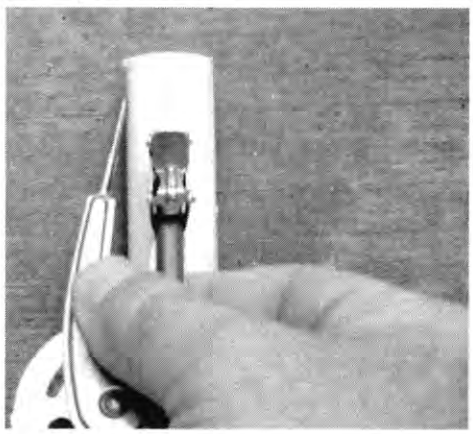


Do this on each side and you're done. Make another one for the other end of the track run. It doesn't have to be pretty, it just needs to set the track at the same width as your wheels.

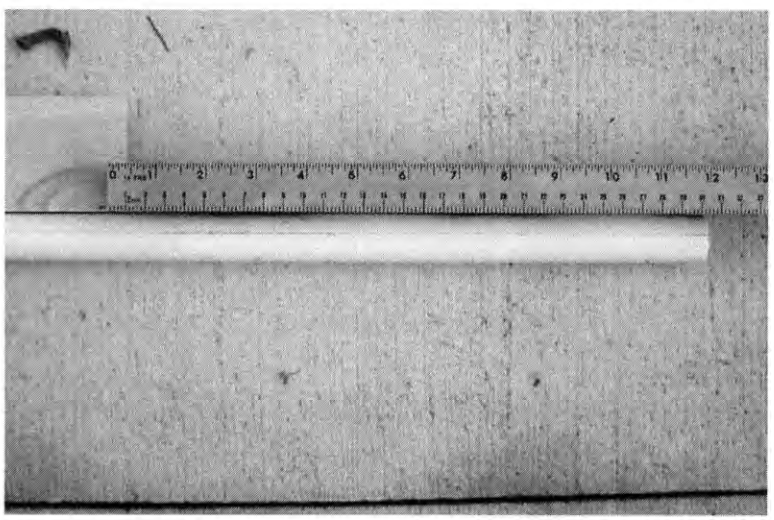
Attaching dolly track to lumber for dolly shots over rough terrain:



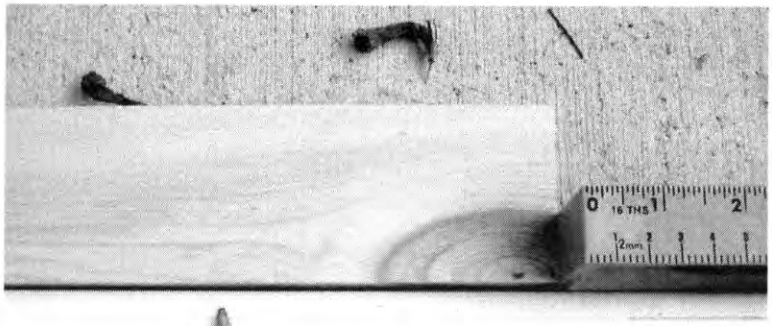
You'll need one 10' length of 3/4" PVC and one 8' by 3" -6" wide bit of lumber. I'm using a 3" wide piece of pine, but if you've got a lot of track to make, cutting down a sheet 3/4" thick of plywood into 4" strips would be a cheaper and better way to go.



Take a compass and adjust it so the pointy end rests against the side of the PVC and the pencil rests on top. Don't move it from this position and carefully run a line down the entire length of the PVC. This marks the "top" of the pipe.



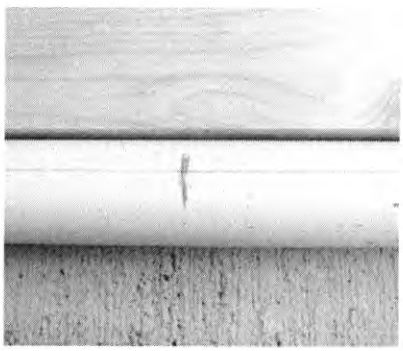
Lay the PVC next to the lumber and adjust it so the PVC extends one foot beyond each end of the lumber.

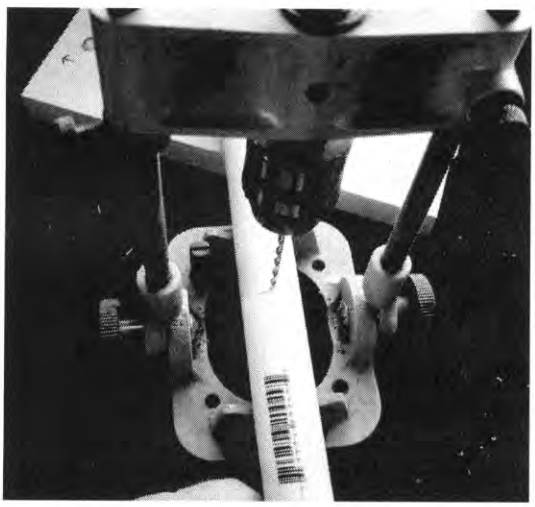


Draw a line across the line that runs down the PVC around 5" from the end of the board.

Do this on the opposite end and at two or three points in-between.







Drill a small pilot hole through both sides of the PVC on each of the cross marks. I'm using a 3/32" bit. Just make sure the bit size is smaller than the screw you're going to be putting in here.



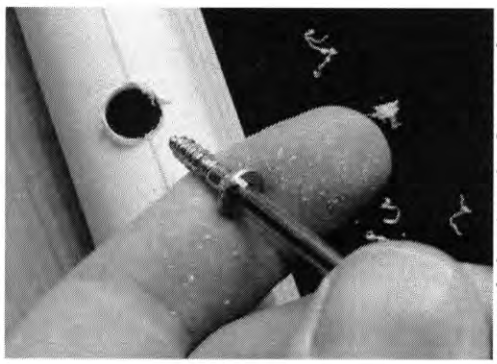
I'm using this great **drill guide** that holds tubing in a 'V'. Check out a better photo and description on page 32 under "The Shock Corridor Stabilizer" tools list.

Now load up a bigger bit. The diameter of the bit must be bigger than the head of the screw you're using. Mine is 5/16ths.





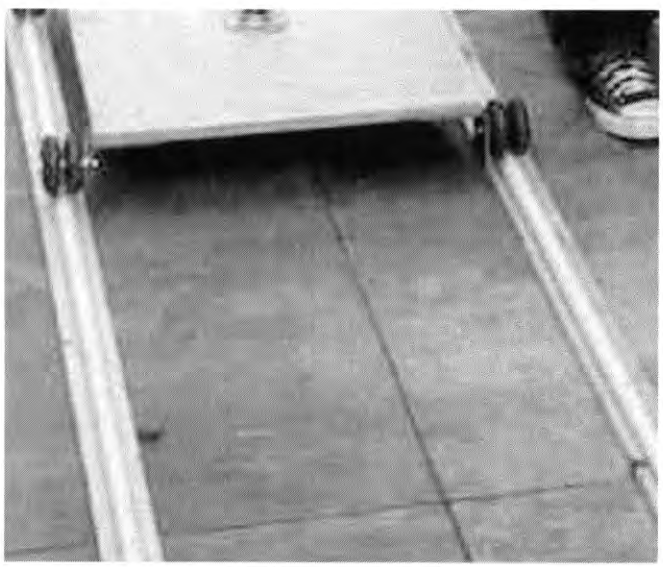
Drill a hole through the TOP of the PVC on each of your pilot holes. DO NOT GO ALL THE WAY THROUGH AS YOU DID ON THE SMALLER HOLES!



As you can see, the large hole is just an access hole for putting a screw through the bottom hole.

Center the PVC pipe on the lumber and put a screw in each of your holes. Make sure the PVC is straight before you screw it down.





And there it is. If you have more than one length of a run, put a bit of wood (the same thickness as your track wood, please) under the connecting points of the track.

If the track is up off the ground, you can clamp a few cross pieces of lumber along the length of each pair of track with a simple clamp, similar to ties on a railroad track.

THE SHOCK CORRIDOR CAMERA STABILIZER

Ever since Garret Brown invented the Steadicam™, every filmmaker has been drooling over getting one. Now, because of the lighter cameras, there have been a horde of copycats for the DV market. Most of these commercial ones cost upwards of $1,000 or more, putting them way out of range of most of us.

Well, here's one you can make for around 40 bucks. Does it work as well as the commercial versions? In my experience, yes. In fact, I made a little improvement (a rotating handle) that isolates wrist movement. Something the lower cost stabilizers don't have. Take your time when building this, because everything has to be perfect.

A word to the wise: a camera stabilizer is not the be all end all. It's great for some things and lousy for others. (For example, if you're doing a tracking shot, a dolly is easier and better. If that tracking shot is over the bombed out rubble of a building, go with the stabilizer.)

Whether you're using a home-made rig or a commercial one, these babies take a TON of practice. Garret Brown used to teach (maybe he still does) workshops to professional operators. These are guys who use this stuff day in and day out, and they still take workshops. This is a great tool, but you'll need to practice, practice, practice.

At the end of this chapter you'll find instructions on how to balance your new rig and some helpful lessons to get you started.

Be sure to read the **"Make it Groovy"** section before heading off to the hardware store!


SONY

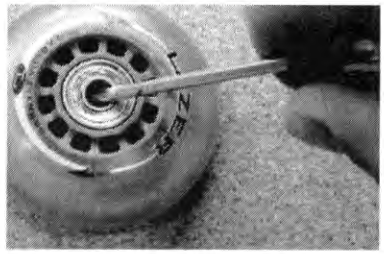
SHOCK CORRIDOR STABILIZER PARTS LIST



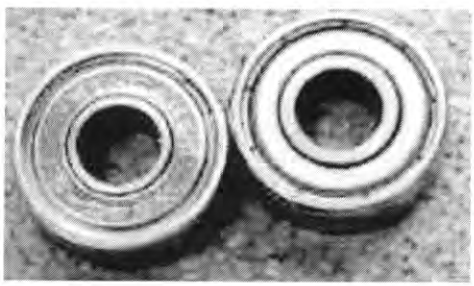
(1) In-line skate wheel WITH bearings.

Some wheels come with bearings, some don't. If they don't, just buy a package separately. You can use the rest of them on the dolly and crane handle projects.

Also, if your wheel has an axle in the bearings you'll need to remove it. (The bearings pop right out with the help of a screw driver, then just remove the axle and push the bearings back in). ☐



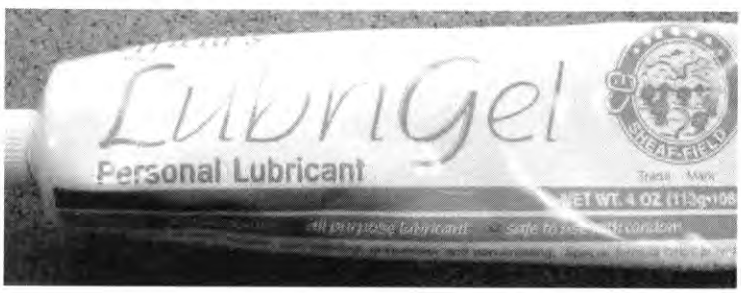




(2) In-line skate wheel bearings. The are in addition to the ones in your wheel.
One advantage of buying your bearings separately from the wheel. Otherwise, you'll have to pop these out of an extra wheel. ☐



(1) foam handle bar pad. Either bicycle or razor scooter type. If you're making the crane handle, you might get 2. ☐



You'll also need a tube of water based **"Personal Lubricant"** to oil up the handle pad to be able to slip it on to the handle. ☐



(2) 5/16" jam nuts for the threaded rod. (Jam nuts are narrower ---thinner-- than regular nuts. If you can't find them, you can use normal ones).



(2) 5/16" lock nuts for the threaded rod. Lock nuts have a nylon ring that holds it tight to the bolt. (You might also see these called "Stop nuts").

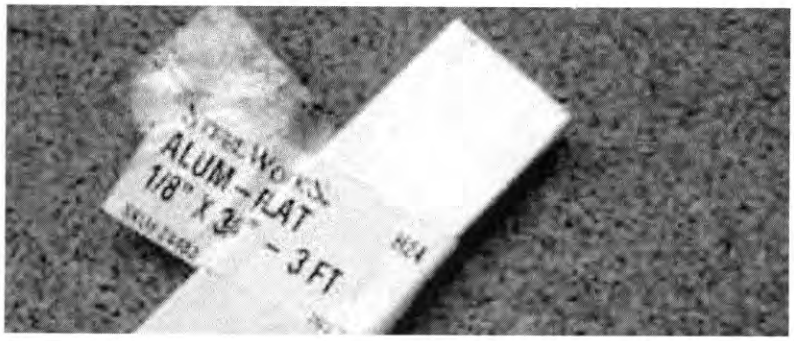




J-B Weld
This is like a super glue for metal. It comes in 2 tubes which you mix together.



Pro lock or Lock tite
This keeps nuts in place. If you can't find a lock nut, you'll need to use this stuff on the nuts.



(1) 1/8" thick x 3/4" wide aluminum bar. They usually come in 3' lengths, but you'll only need 9" or so.



Aluminum tubing. There are a couple different types of tubing you can get. Regular 'ol aluminum tube or anodized aluminum. The anodized stuff comes in an assortment of colors and is pretty hip. You'll need (1) 1 1/4" O.D. (Outside Diameter) and (1) 1" O.D.. The color ones usually come in 6' lengths, so you won't use the entire lengths of these, but you can use what's left over for other projects.

1 1/4 inch o.d.

1 inch o.d.



(4) 7/8" plastic sockets. These come in packs of 4 and are used to shove into metal chair legs to hold wheels. Note: different brands may be designed differently. My measurement is for "Shepards" brand sockets.

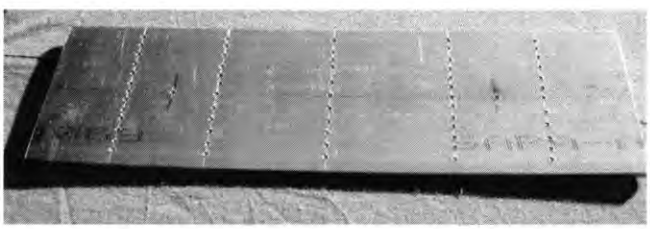


(1) 5/16" threaded rod by 3 feet. Threaded rod is just a big bolt with the head cut off. I've never seen a hardware store that did - n't have these.

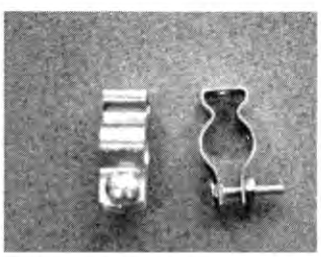


You'll need a piece of hardwood for the camera platform. Try to get one 1/4" thick and 3" -4" wide. You'll be cutting it down later to 10" long. Usually you'll find this special lumber in its own section of the store. It might read "Hobby Lumber" or something like that.

OR MAKE IT GROOVY



Instead of wood, use a 1/8" thick piece of aluminum by 3" -4" wide by 10" long. Pay attention in the "tools you'll need" section for working with aluminum for the camera base.



(2) #2 Conduit hangers. You'll find these in the electrical department. They're used for hanging electrical conduit. The #2 size is for 1" pipe.
See those bolts at the bottom of the hanger? Go get yourself 2 wing nuts that fit that bolt before you leave the store.



These would be the wing nuts for the above conduit hangers. Mine are 1/4". Yours may or may not be. It's always best to screw the nut onto the bolt in the store, just to be sure.

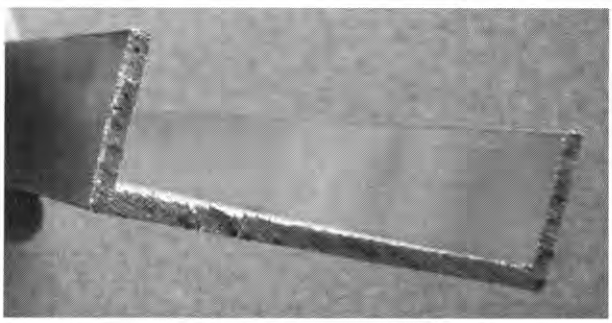


This holds the camera to the platform. Usually the camera base has 1/4" thread, but yours might be metric. Just take the camera to the hardware store and get the right size. Get one 1/2" long unless you're going to use a mouse pad, then 3/4". This is an allen head. A flat head or hex works too. ☐

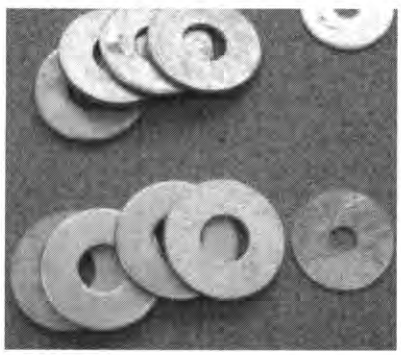


This is for the counterweight base. Get one 12" long, 1/16" to 1/8" thick, and about 4" wide. Or you can get channel aluminum instead (See below). ☐

OR Make it groovy:



The channel allows you to set the rig upright on a flat surface. This is for the counter weight base. Get one 12" long, 1/16" to 1/8" thick, and about 3" - 4" wide. ☐



Pick up about 10-12 heavy duty washers between 1" & 2" in diameter. These are for the counterweights. If you have a heavier camera like a Sony PD-150, you'll need more. Go ahead and pick up 20 or so. ☐



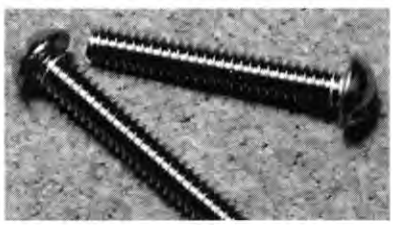
10/24 by 1/2" long screws and nuts. These will hold on the conduit hangers to the camera plate. They don't have to be exactly this size, just no longer than 1/2", and they need to be able to fit through the hanger hole. A flat head screw is even better. ☐



This is an allen bolt, a wing nut and a large washer with a small hole (called a fender washer). These will hold the counterweight washers to the base. Length of the bolt is relative to the thickness of the base and 6 to 10 counterweight washers stacked like poker chips. The additional washer has a smaller hole than the larger ones. You need this, otherwise the wing nut would just drop down the big washer holes. You'll need 2 sets. Also, there is no reason I'm using an allen bolt here. They just look really nice. You could just as easily use any old bolt. I'm using a 1/4" bolt.



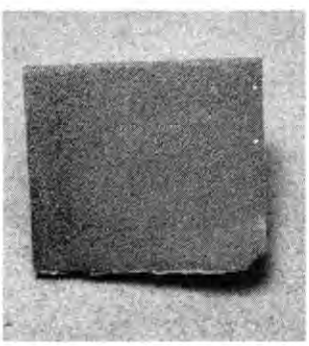
(1) This is called a cap nut. You can use any ol' 5/16" nut, but this one looks nice, and makes your rig look a little more pro.



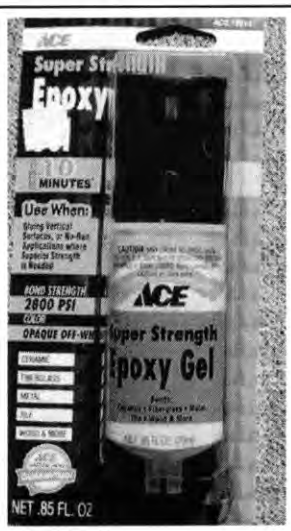
(2) 10-24 or larger by 1 1/4 to 1 1/2 inches long bolt. These hold the handle bracket to the wheel. The length of these depend on wheel diameter. Take a look at steps 5-16 for more info. Allen bolts look good here too.



Some **cork** or **tool drawer liner** or best of all: **A MOUSE PAD**. Get the cheap cloth covered one, and rip the cloth off. This is for covering the camera plate. Use the mouse pad if you're using the Make it Groovy materials.

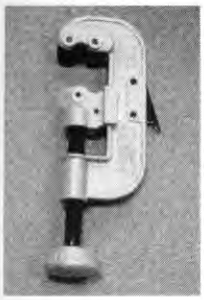


A little square of sand paper. You'll use this to roughen up the bearing before gluing.

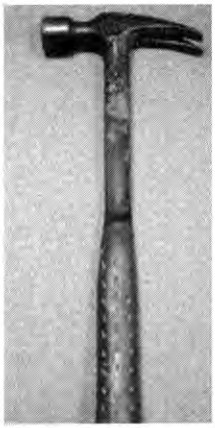


Super Strength epoxy. This is for the wheel bracket bolts.

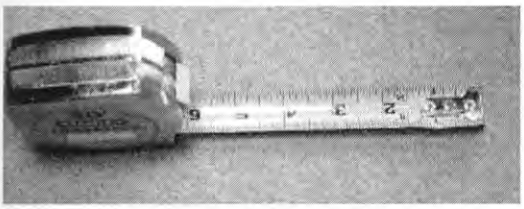
SHOCK CORRIDOR STABILIZER TOOLS LIST



Pipe Cutter. Make sure you get one that will go around the 1 1/4" OD tubing. ☐



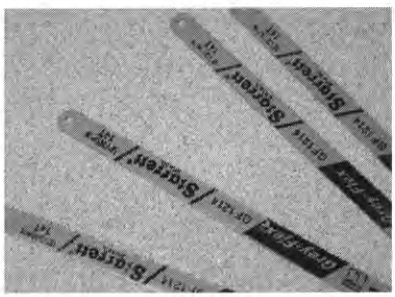
A hammer for thwacking ☐



Tape measure ☐

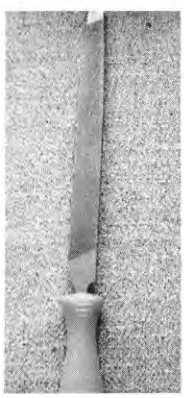


Hacksaw. Get extra blades. We'll be cutting aluminum, so get blades that have NO MORE than 16 teeth. ☐

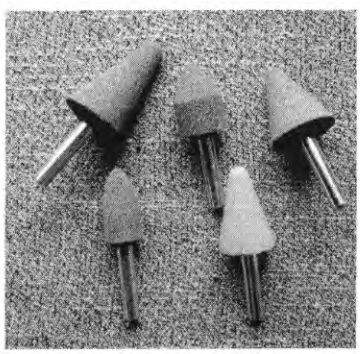




Vise. Gotta have it. I found this one at OSH for $9.95, so the investment is minimal. Mount it on your bench or a heavy piece of plywood. ☐



A metal file and some grinding stones for your drill. If you're making the wood camera platform, you can get by with just the grinding stones. Make sure they're cone shaped. Get a few, they wear out fast. If you're making the Groovy camera plate, get a file. ☐ ☐





Center Punch and Prick Punch.

A center punch is used to put a small dimple in metal where you're going to drill a hole. You have to have this or your drill bit will "walk" across the metal, and that's not good at all.

The Prick punch scratches into the metal for marking (a pencil comes off too easily).



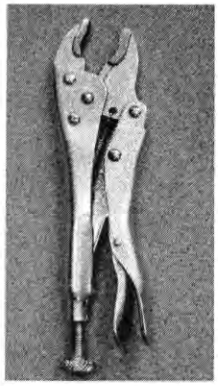
If you don't have a drill press, I really encourage you to get one of these. It's a handy drill guide, and will keep your holes straight and true--very important in this type of work. It also has a V in its base to hold a round piece of pipe for perfect center drilling (something we do alot around here.) It runs about $35 bucks. A good investment if you build more than one project in this book.



A combination square.

One of the most useful tools on the planet.

You'll especially need it on this project.



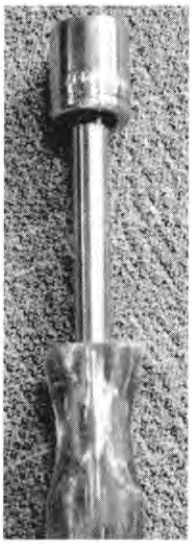
Vise Grips. One is good. Two, will make life much easier. ☐



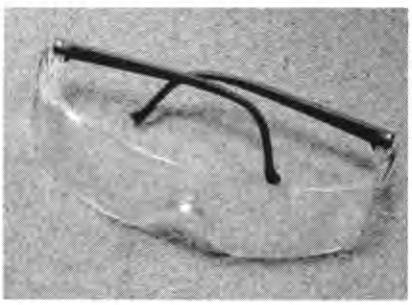
A flat head screw driver. ☐



A drill or a drill press. ☐



A 1/2" socket. This isn't absolutely necessary, But very handy when building the handle. ☐



Safety glasses. We're drilling into metal--these are important and not to be left out! ☐



Cutting Oil. You use this when drilling into metal. You might want to pick up a little oil can to put it in or find a brand that has its own little spout. They're out there, Just kind of hard to find. ☐



5/16" drill bit. ☐

1/2" drill bit. ☐

7/32" bit ☐

9/64" bit ☐

1/4" bit ☐

The 5/16" bit, is the only size you HAVE to use.
The other sizes depend on the size bolt you use on these parts of the rig or whether you're Making it Groovy. Please read through the plan carefully.

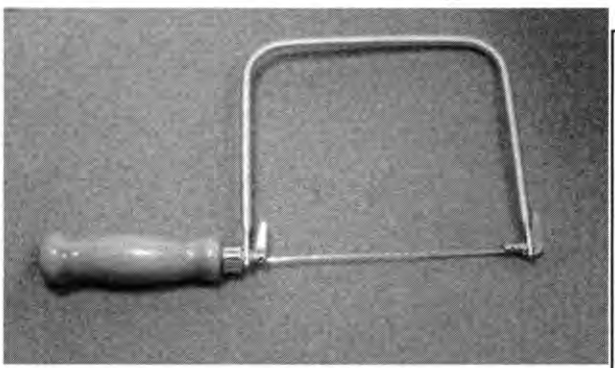


A utility knife for cutting the cork or tool drawer liner. (Although, scissors work better if you're cutting a mouse pad). ☐



A back saw or mitre saw. If you're getting the home center to cut your wood, you can leave this one out. Otherwise, you might want to pick up a mitre box too. They often come as sets, and you don't need a high priced one.

You DO NOT need a back saw if you're making your camera bracket out of aluminum! ☐



Coping saw.
If you've got a router or jig saw, you don't need this. Otherwise, yep.

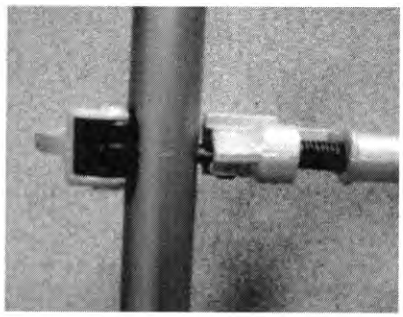
Unless You're making an aluminum camera bracket, then **you will not need a coping saw.** ☐

OR



This handy little drill bit/saw combo. The shaft of the bit acts as a saw. Very handy and cheaper than the coping saw (but harder to control too!) You **WILL** need one of these if you making your camera bracket from aluminum and of course you can use it on wood. ☐

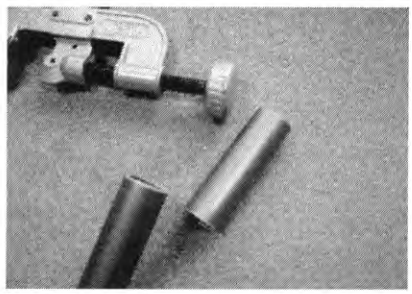
LET'S BUILD IT

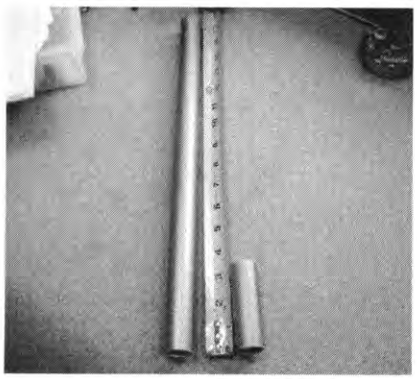


Cut a 3" length of 1" OD pipe.

1.

Well Done!





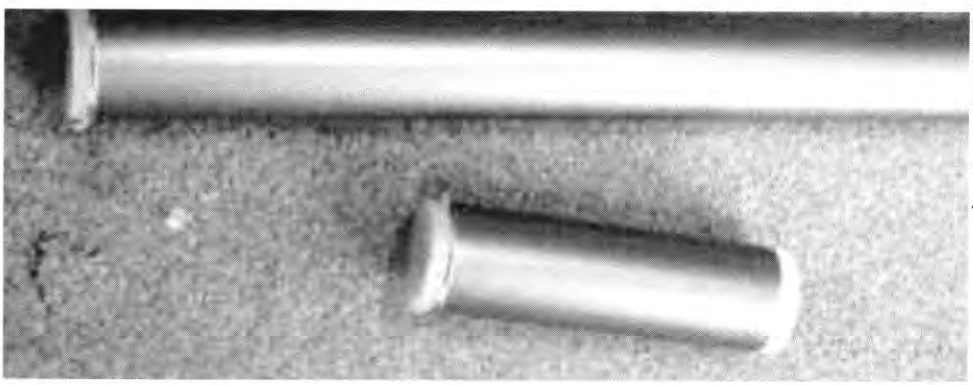
Cut another 16" length of 1" OD pipe.

2.

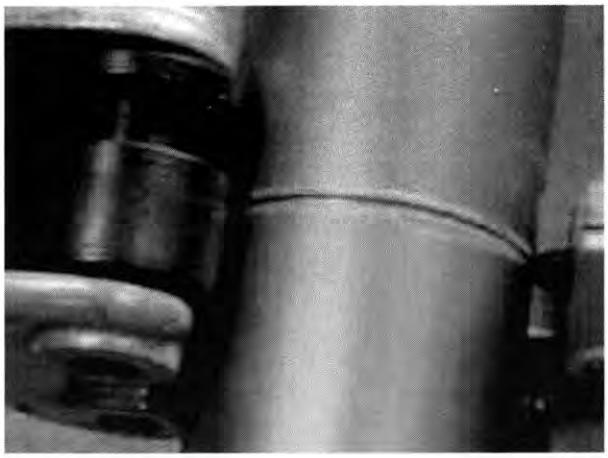
Speeding right along, aren't we?

3. Take the plastic sockets and shove them in as far as you can by hand, then take a hammer and give them a few good THWAKS to drive them the rest of the way in. Do this on both ends of both sections.



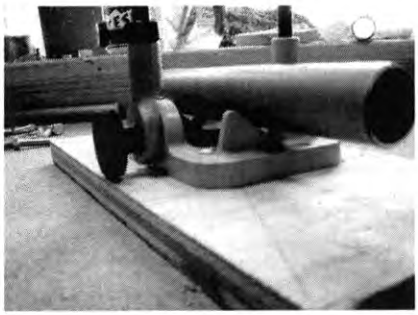


Take a knife and trim off any plastic that may be sticking out from the thwaking.



Cut a 9" piece off the big 1 1/4" diameter tube.

4.



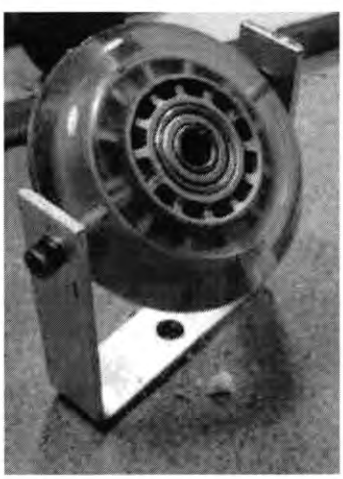
Make a little mark dead center (4.5") and set it in the drill jig.



Drill a hole with a 5/16" drill bit down through both sides

Beautiful, Baby.



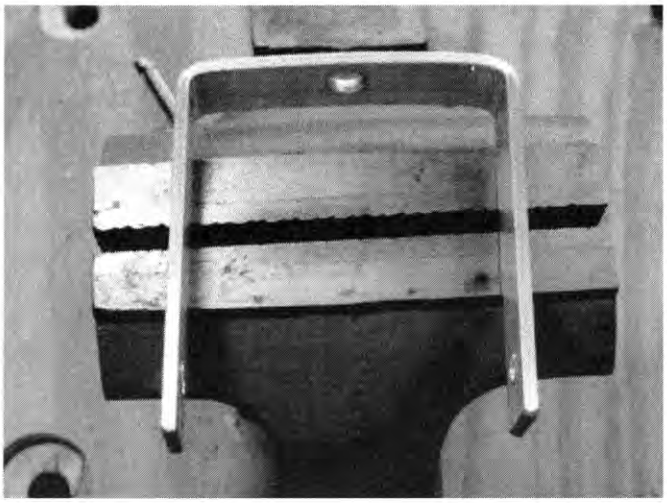


Next we'll make the wheel gimbal unit. This is probably the hardest part to make, and it's not really hard at all. Just take your time and make sure you make every thing just right.

5.

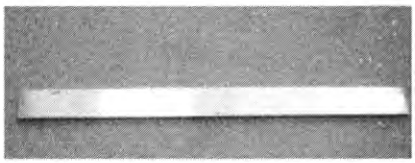
Measure the diameter of your wheel. This one is 2 3/4". Add 1/4" to whatever your measurement is. In this case that would put our measurement at a total of 3".





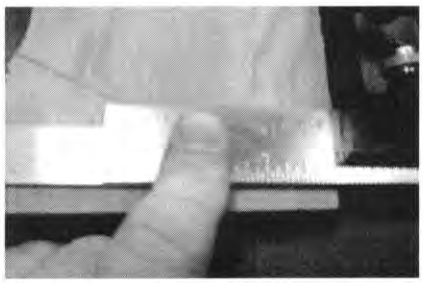
This is what we'll be using that measurement for. We want the left and right side of this bracket to be 3" (regardless of wheel size.) Then take wheel measurement of 3" and add all that together: 9", right?

6.



Take that 3/4" wide x 3' piece of aluminum bar, put it in your vise and cut it down to 9" (or whatever your measurement ended up being).

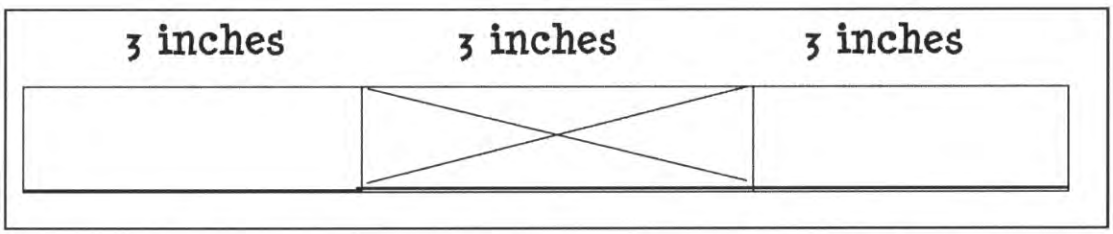
7.



Measure 3" in from each end and use your prick punch to scratch a mark **square** across the bar.

Measuring in 3" from each side will give you the correct width for the center section.

8.



In the center section, between your two marks, make an X going from corner to corner of the rectangle made by the marks. Where the 2 points cross will be DEAD CENTER of the middle section.

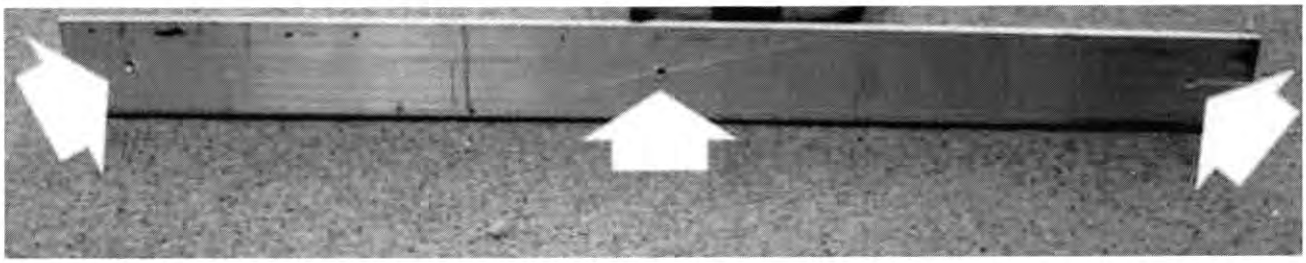
9.

Use your punch and a hammer to make a small indentation on the center of the X.



10.

Measure in 1/2" from the end of your bar and hammer a dimple half way across the width of the bar. Do this on both ends.



You should now have 3 little dimples. Now we're going to drill some holes.

11.



Clamp the bar (dimple side up, please) down TIGHT against your bench on a piece of scrap wood. Put a 5/16" drill bit in your drill, add a little lubricant to the center dimple, and drill away. Start slow, about half speed. Metal likes a lower drill speed.



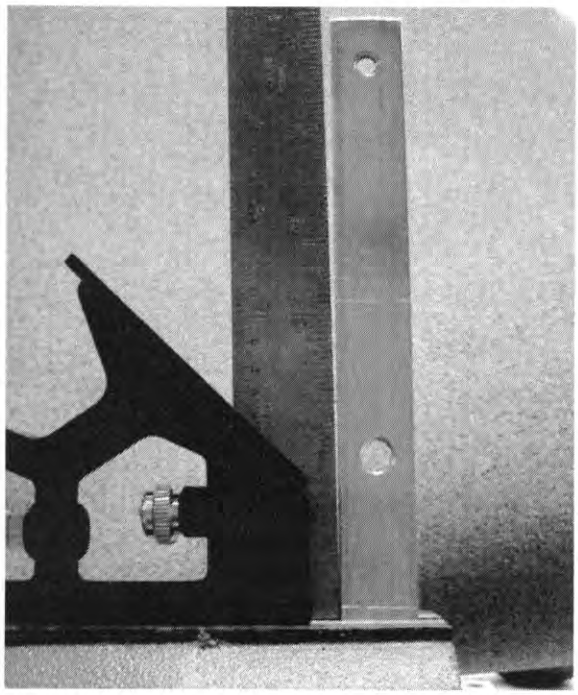
Change to a smaller bit for the size bolts (mine are #10-24) you got to attach the bracket to the wheel. The hole should be slightly larger, so the bracket moves freely. Drill the smaller holes in the dimple on each end. I used a 7/32" bit.



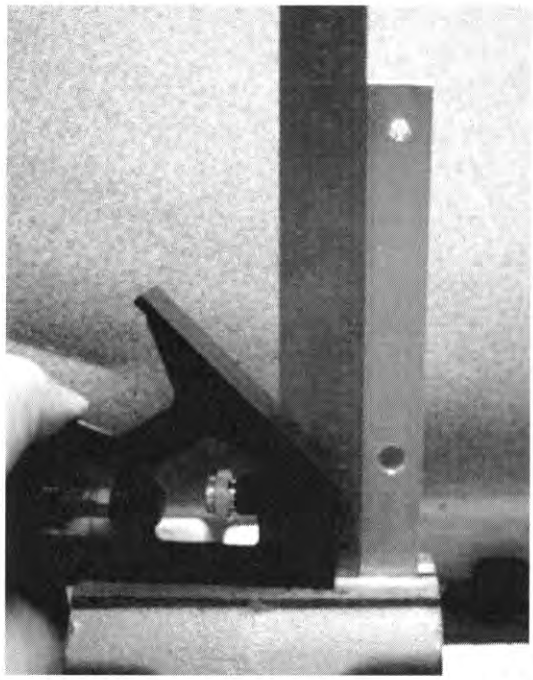
You should now have something that looks kinda like this. I have a confession: take a close look at the center hole. See how is it not quite dead center from top to bottom? That is because I didn't make my dimple deep enough, and the bit walked. Learn from my mistakes!

Let's do some bendin'!

12. Clamp the bar in your vise with the 3" line you made earlier an 1/8" above the teeth of the vice. Use your combination square to make sure it's, you know, square.

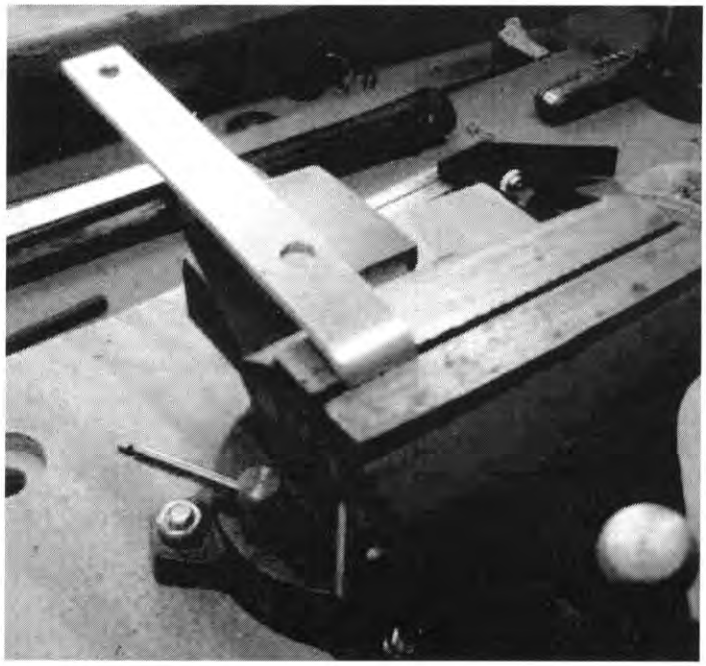


Hey, lose that gap, sister!

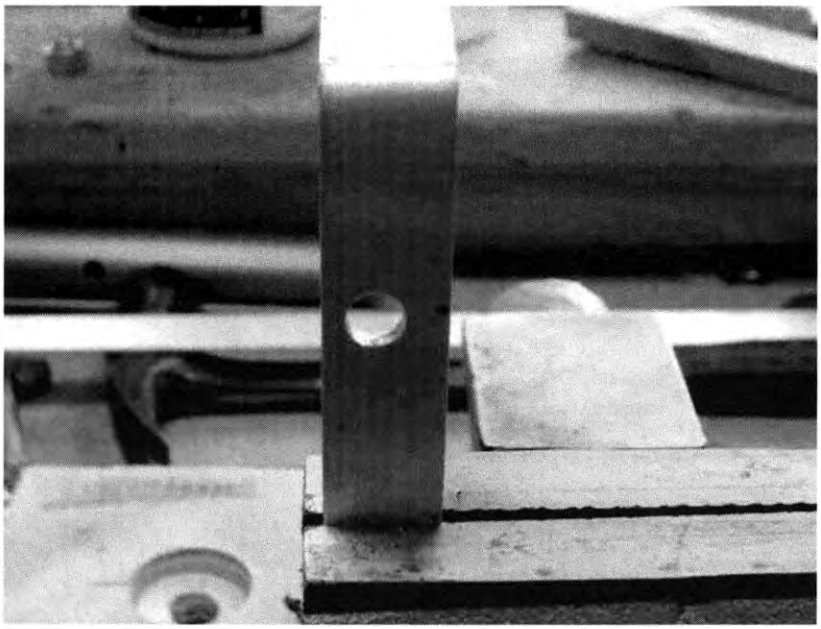


That's more like it. Nice and square. Now you can bend it.

Just muscle that thing over, Junior. To get a clean 90 degrees, use a hammer to tap it down the last few centimeters. If you can't seem to get the bar bent, slide some of that spare tubing over it (at least a foot or so) and use that as leverage. It'll bend like butter.

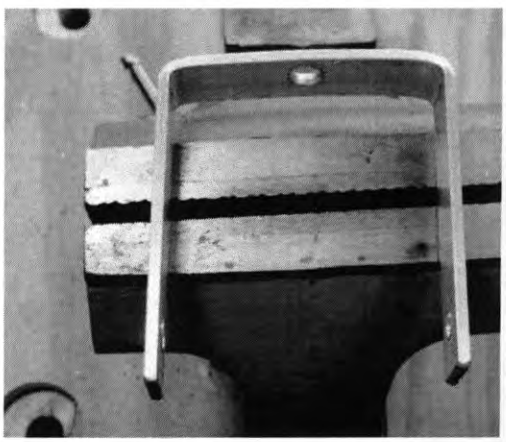


A word to the wise:
Some of the aluminum I've used for the handle has broken when bent as far as this, and it was always scrap stuff that sold in 12 inch lengths at the metal supply shop. On the other end, the 3' lengths sold at home centers like lowes or Ace have never failed me. So if you find yourself at a metal supply getting cheap stuff, buy a few of them!



Next, flip it around and do the same on the other 3" mark. Don't forget to square it up!

And there she is. Nice job.



13.



Now we need to drill a couple of holes in the wheel for bolts that hold the handle bracket. Use a felt tip pen to mark the center of the edge of the wheel. There is usually a manufacturing seam along the outside edge that makes this easy.

A FEW WAYS TO FIND THE DIRECT OPPOSITE SIDE OF THE WHEEL

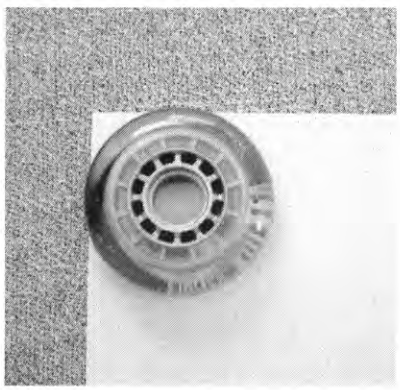
We need to find the direct opposite side of the mark you just made. Basically, we're just cutting the wheel in half.



The lazy way is to just use a ruler and eye-ball it. Not the best way to go about it.

OR...

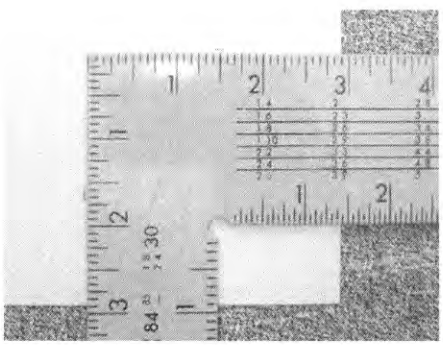
Grab a piece card stock, something along the lines of an index card will work fine. Set the wheel on the corner of the card so the edge of the wheel lines up with the sides of the card. Locate the edge of the wheel opposite the out-side edge of the paper. Make a small mark on the remaining two sides.



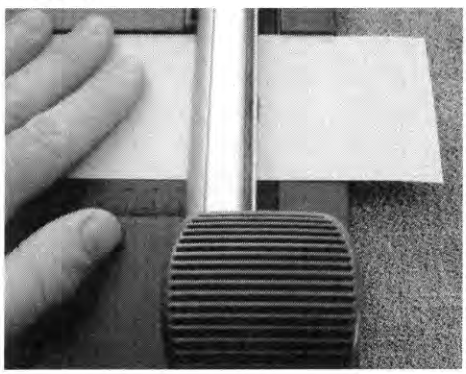


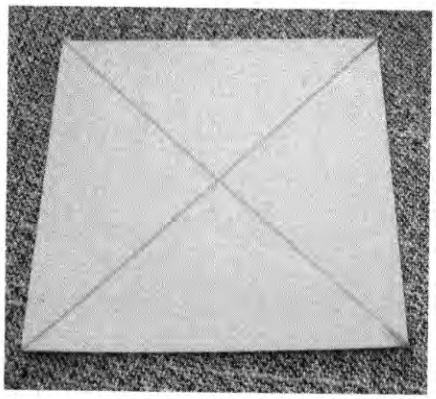


Make sure your marks are the same distance on each side.



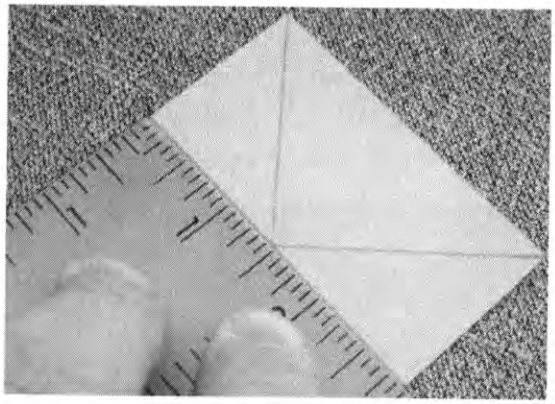
Trim your card on the marks so that you get a perfect square...

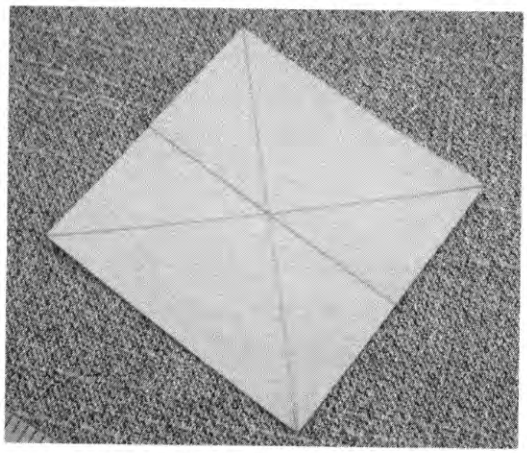




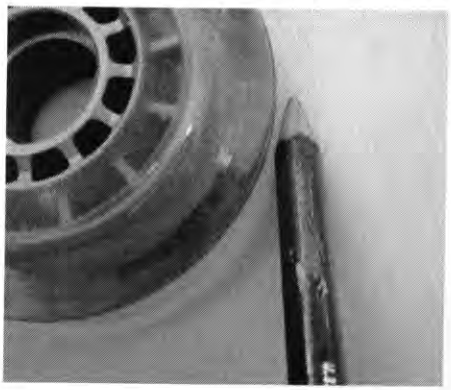
Draw an "X" from corner to corner...

Then draw a line through the center of the "X", cutting the card into two equal halves.

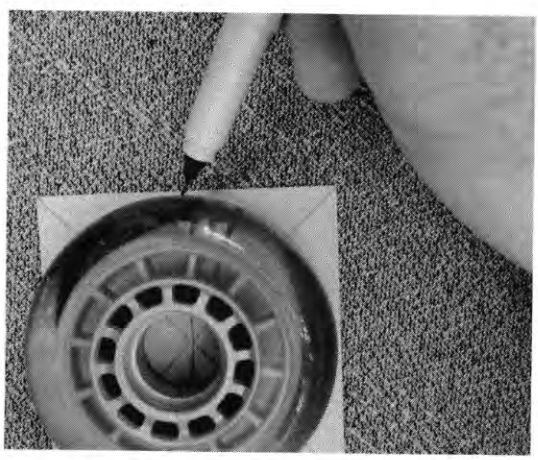




Set the wheel dead even on the card and line up the mark you made on the wheel to the the center line across the card.







Now it's a pretty simple matter to follow that line to the opposite side of the wheel and make your second mark.

14.

Clamp the wheel to the bench--and I mean this--CLAMP THE WHEEL TO THE BENCH! Carefully, and slowly drill straight and level through to the center of the wheel using a bit a little smaller or the same size of the size of the allen bolt or machine screw you're using to attach the handle bracket to the wheel. In my case, I'm using a 9/64" bit. Do this on each side. A level on your drill is very helpful here. Go ahead and drill all the way to the center of the wheel from each side.



This is one time where a drill press would be great. If you have one, just clamp the wheel between 2 pieces of scrap lumber (2x4's work nicely) to hold the wheel vertically under the bit and drill away.

Also, if you screw up, don't worry. There's no need to get a new wheel--it's a circle, just move to a new point and start over. If you'll look closely at the photo you'll see the mess I made on the left side of the wheel. Hey, no editing the mistakes in this book! It's all apart of being human. Let me also take this opportunity to say: do all of this work on a full nights sleep and a stuffed belly.

If you used the paper 'X' method to locate where to drill your holes, leave it under your wheel when drilling. The line in the middle makes a handy guide.

When you're done, blow out the excess rubber in the holes. (As Ms. Bacall sez: "just put your lips together and blow.")



15.

OK, gather up all the parts for this little section: the handle bracket, the two screws for the holes you just made and the wheel of course. You'll also need a toothpick and something to mix the epoxy together.

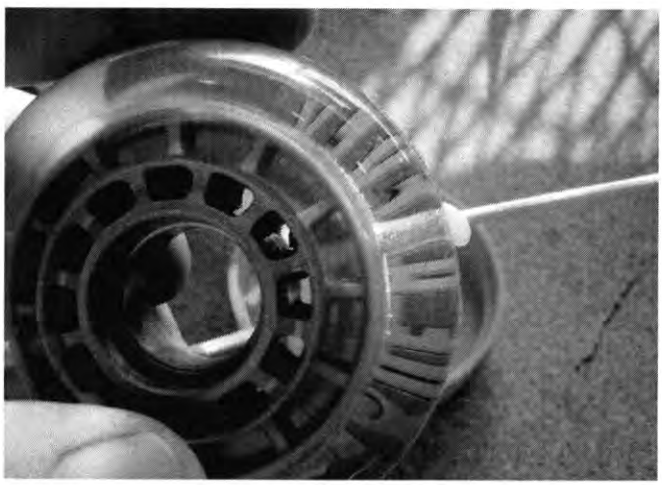


Follow the directions on the epoxy and mix the two parts together. And PLEASE use epoxy. Superglue types of glues just won't last on this kind of work.

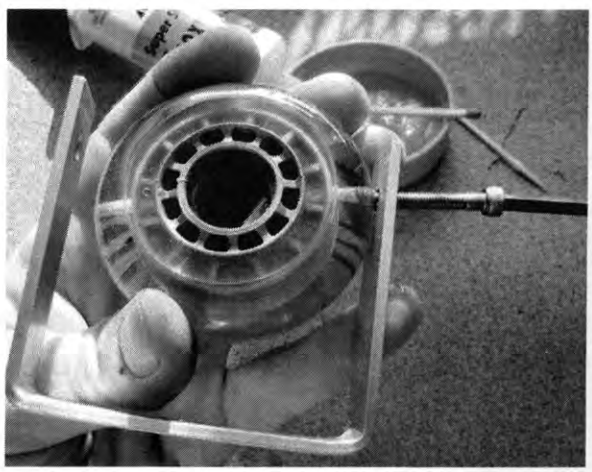
Next, get a nice coating of glue on the tooth-pick...

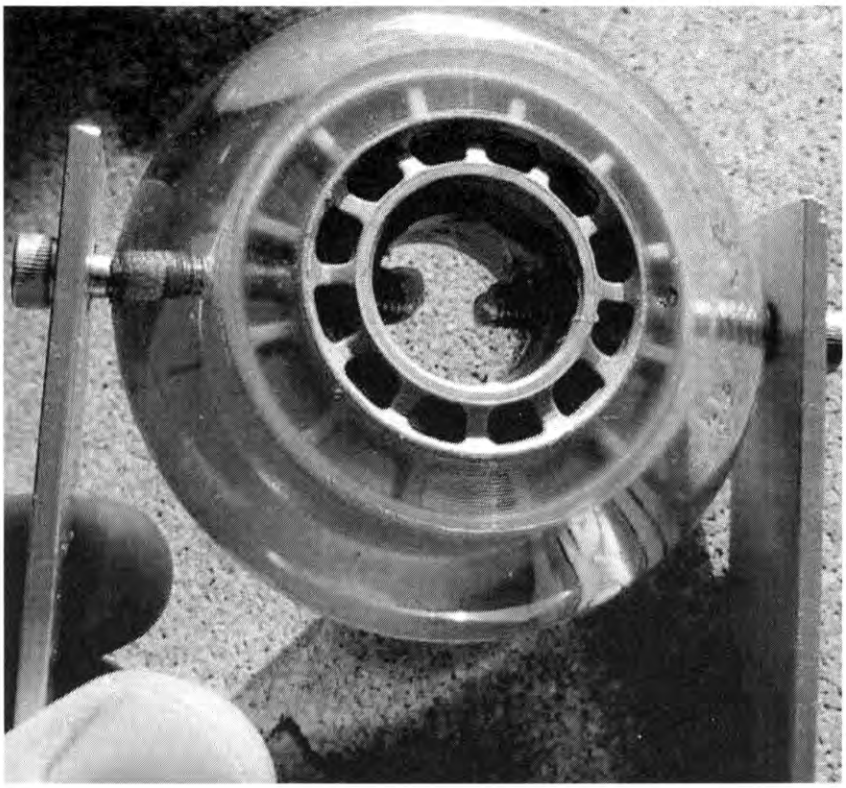


...and coat the holes in each side of the wheel with a good glob of the stuff.



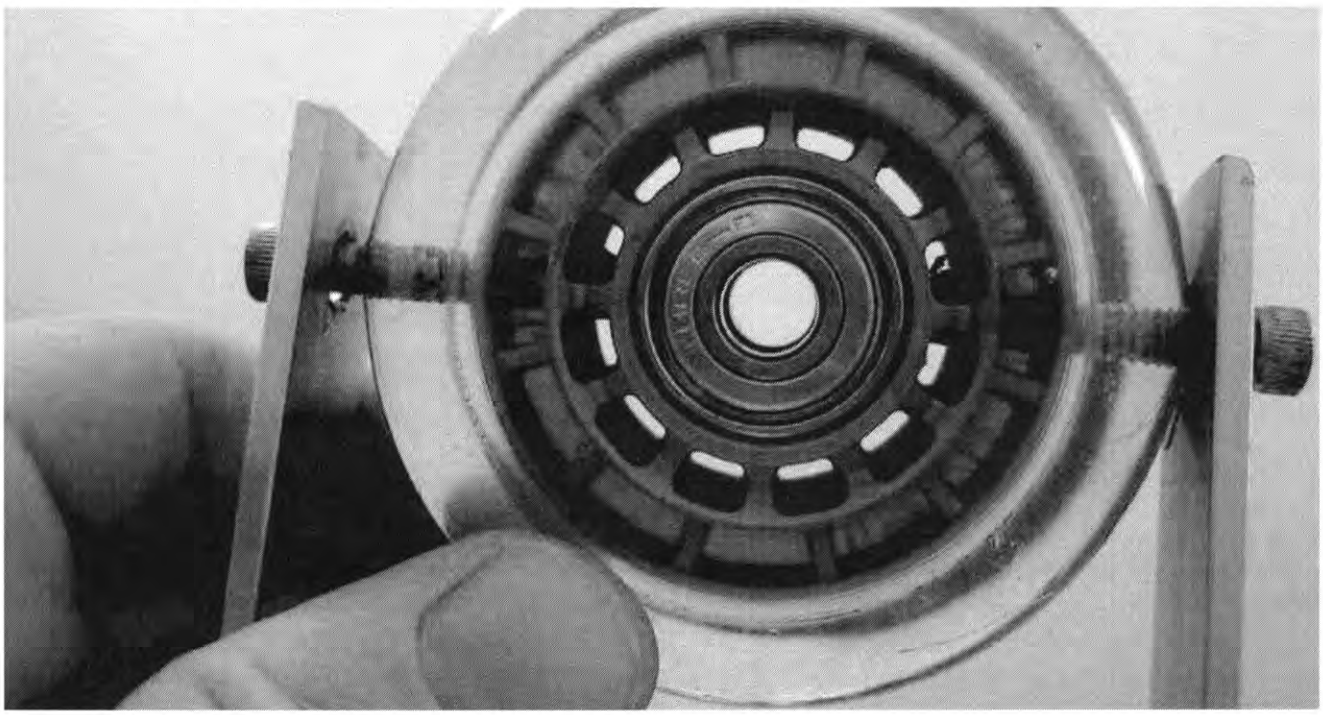
Before the Epoxy starts to harden, grab your bracket and screw and quickly attach the bracket through the side hole.





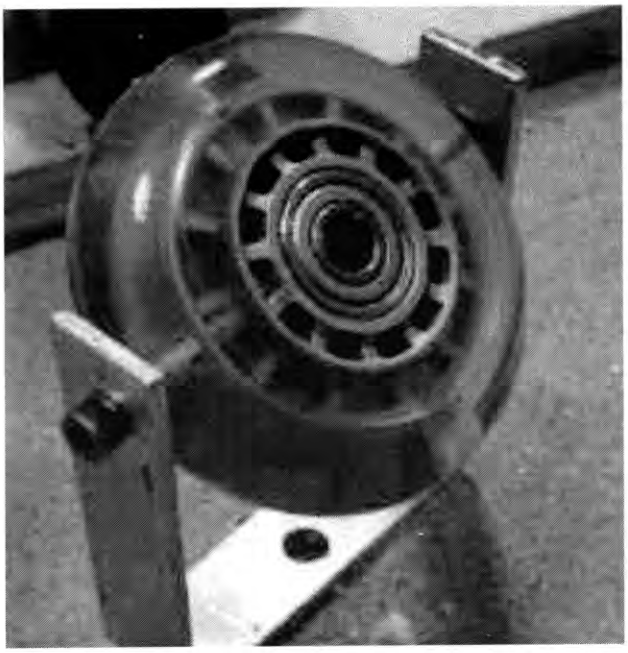
When you're done it should look something like this.

You'll notice I've used long allen bolts that go all through the hub. This isn't absolutely necessary, especially if you're using a lighter camera, but you should atleast get into that first layer of the plastic part of the hub.

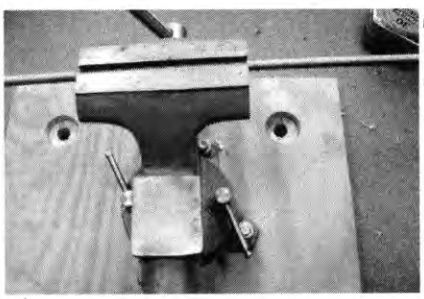


LOOK CLOSELY AT THIS PICTURE.
Notice how the bolts DO NOT go as far as to block the bearing hole?
If you can see your bolts in the bearing hole, back them out quickly before the epoxy sets! The idea is to have bolts long enough to get into the plastic, but not so long that you've got a lot of wiggle room between the bracket and wheel.

Clean off any excess epoxy and don't tighten the bolts down too much. You want the wheel to spin freely in the bracket.



16.



Take the threaded rod, measure off 24" and clamp the thing in the vise.

Take your hacksaw and start hacking. See how I'm holding it, using my left hand to steady the blade? Load the hacksaw blade so the teeth are pointed away from you. Don't go too fast or you'll wear the teeth down. About 40 strokes a minute is good. Now, 24 inches is still going to be too long. We'll be trimming it down again later. I'm doing it this way, because mistakes can be made, and it's just safer to cut it to final length once the tubes are on. Your other option is to not cut it at all right now, but you'll be sorry you left it long when you get to step 21.

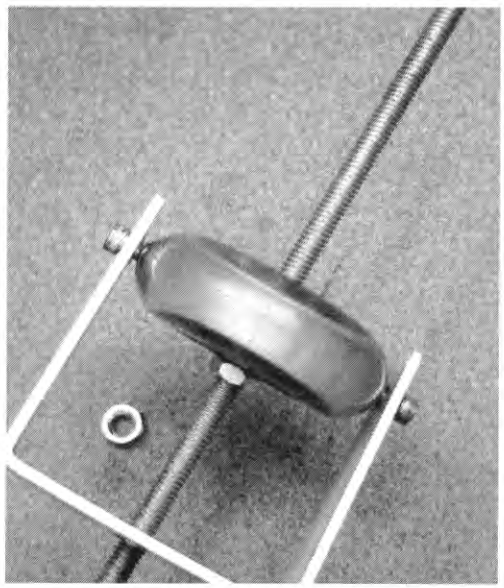


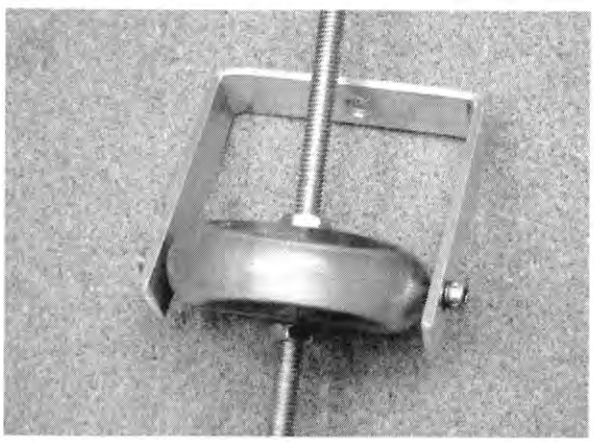


Take a jam nut and screw it down onto the rod about 7 or 8 inches.

17.

Then slip your gimbal unit to the nut....



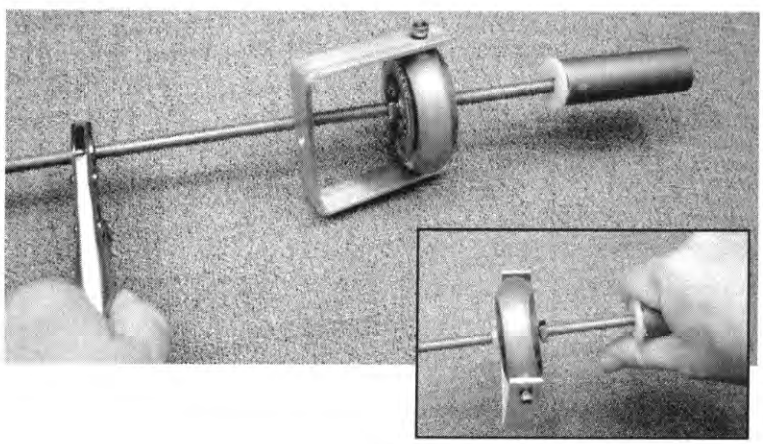


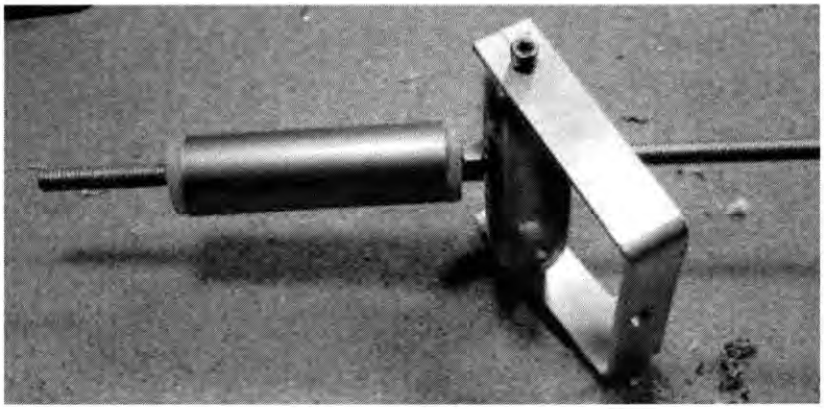
...then add the second jam nut on top of that.

I like putting the wheel label towards the bottom of the rig so that you can't see it.

18.

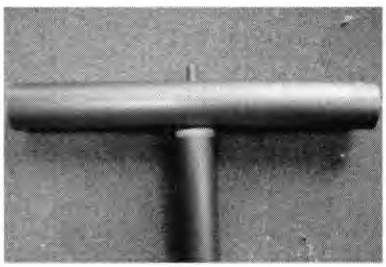
Grab a section of the bottom part of the threaded rod with a pair of vice-grips or pliers. Then take the 3" section of tube and screw it down to the top nut.





Don't worry too much about how much bolt you've got showing at the top. We'll adjust everything as we go.

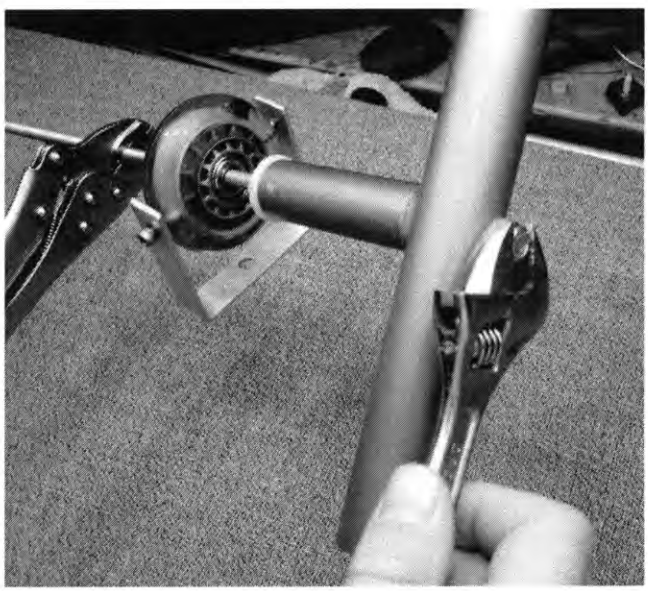
19.



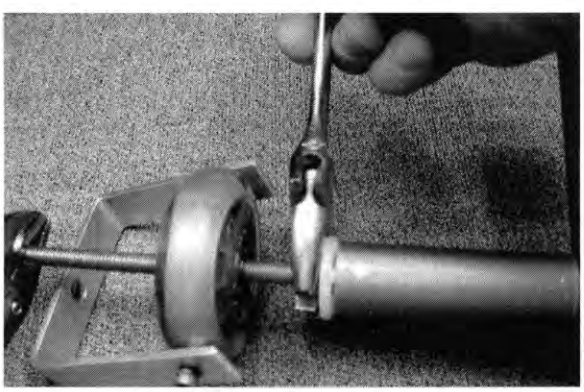
Take the top 9" tube and slide it on to the bolt. Make sure there is enough room for a stop nut.

Take a 5/16 stop nut and tighten it so that the threaded rod is flush with the top of the nut.

(You'll still need to hold the bottom of the rod to tighten the stop nut on.)



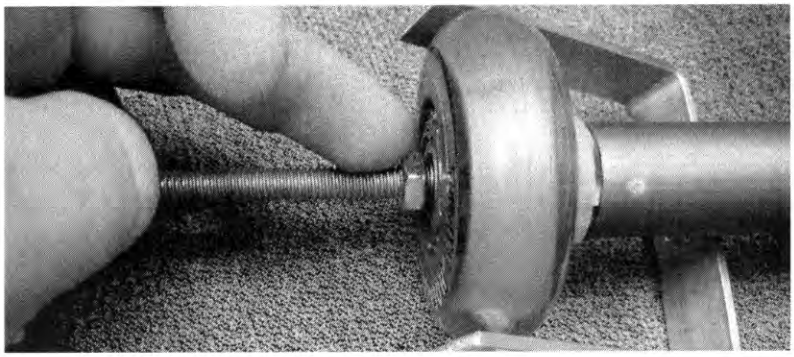
20.



Tighten the top jam nut (the one above your wheel) TIGHT against the bottom of the 3" tubing.

Basically, we want the big tubing on top and the 3" tubing below to feel like one piece by tightening the top and bottom nuts towards one another.

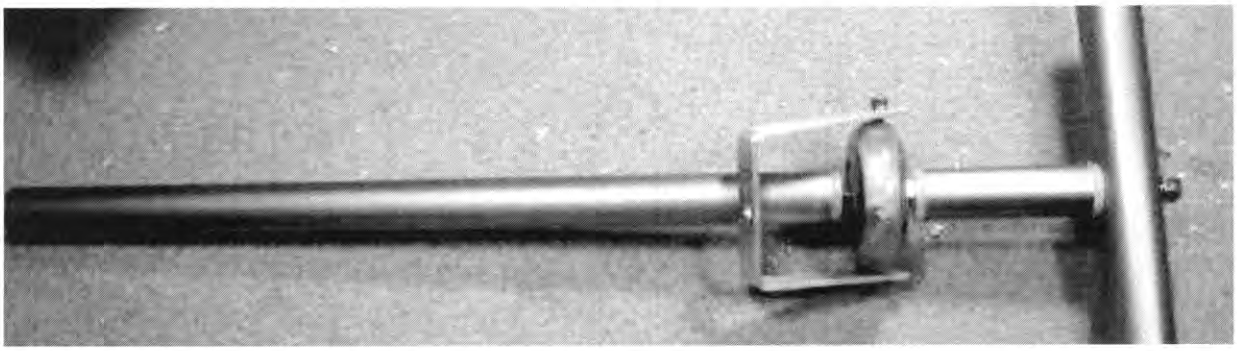
Move the wheel against the top jam nut, and screw the bottom jam nut up against the bottom of the wheel.



Not too loose and not too tight! The wheel should spin freely without moving up and down on the rod.

21.

Next, screw the long part of the tubing onto the rod.



This isn't easy. It will seem like FOREVER before you get that thing twisted all the way up to the wheel.

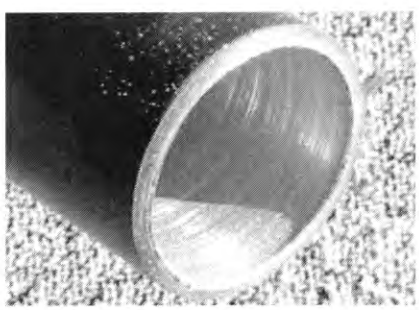
22.

Now let's make the handle unit.

Cut a 5" piece off the smaller tubing.



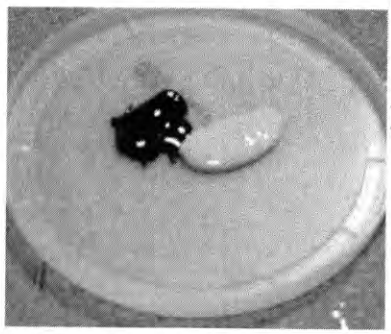
Roughen up the inside of the tube on each end with sandpaper...



...do the same on the outside of the bearings. Wipe everything clean.



23.



Squeeze an equal amount of JB Weld onto a lid and mix it fully. A popcycle stick works great (although, I prefer an Eskimo Pie stick.)



Glup a thick layer of the JB Weld all the way around the outside of the bearing. Be careful that it's only on the outside.

Now, these in-line skate bearings fit perfectly into this 1" O.D. tubing. Coincidence? I think not!

Slide the bearings into the tube--one on each end--and wipe away the mess that oozes out. Make sure these are sitting straight inside the tube!





As you can see, on one end of the tube I've set the bearing flush with the top. On the other end I've inset the bearing just a bit. This is to hide the nut that will be on the bottom end of the handle. This isn't necessary, it just looks nice.

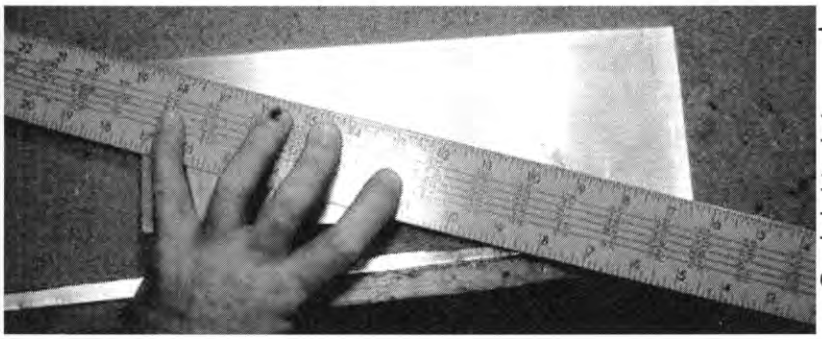
Set the whole thing aside for 24 hours to dry.



24.

MAKING THE BASE . See the **MAKE IT GROOVY** section

I'm using a 4" x 12" x 1/4" hunk of aluminum. If you can't find aluminum, you can use a 1/4" piece of Oak. Also, an 1/8" piece of aluminum works fine too. The commercial versions part of this is only about an 1 1/2" wide. The wider base works much better.



Remember the X we made to find the dead center of our handle bracket? We're going to do the same thing here.

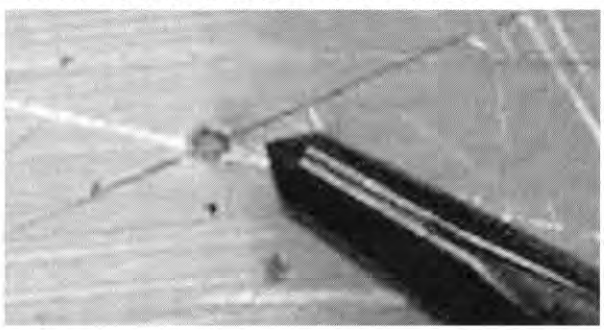
25.

Take your center punch and place the tip right on the X.

Give it a good THWAK or two.



You should end up with a dimple that looks a little like this:



Here's the idea:

X X X	X	X X X

Now we need to make 6 more marks. Measure in about an inch from one end and put a mark dead center. Move 2 inches from the end and do the same. Move in 3" and make one more. Do the same on the opposite end and use your center punch on the marks.

26.



CLAMP the aluminum to the bench on top of a piece of scrap lumber.
Put a bit of cutting oil into the dimple and load up your drill with a 5/16" bit.

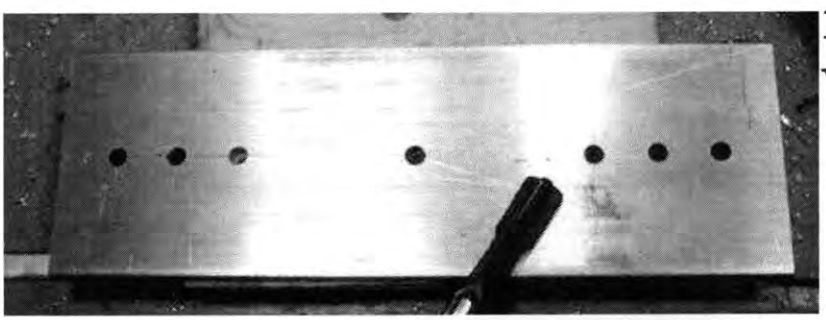
27.



Put on your safety glasses and drill away. If you want, you can use the 5/16" for all the holes. I prefer the outer holes to be 1/4".

WARNING: Sometimes the bit will jam and try to rip your arm off in the process. As soon as it jams, let go of the trigger. If you didn't clamp your work down and this happens, have your first aid kit handy. CLAMP YOUR WORK!

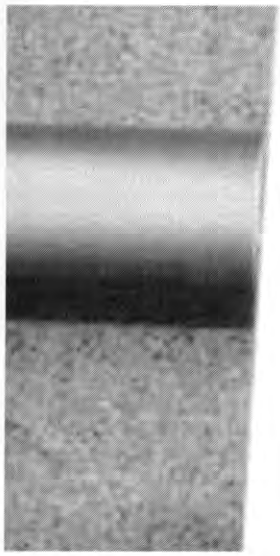
To work through the jam, reverse your drill rotation and back the bit out. Starting slightly above the hole, get your bit moving forward at a good clip, AND THEN lower the bit into the hole. If you start with the bit in the hole, IT WILL jam again.



Here's what you'll have when you're done.

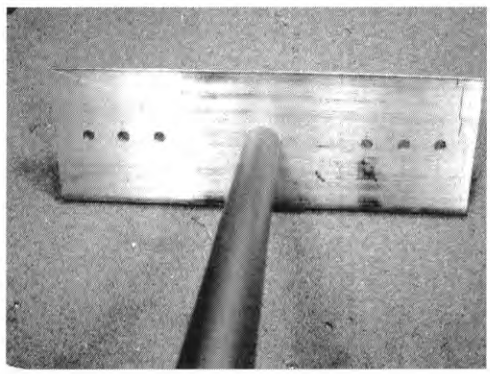
28.

Slide the base on through the threaded rod. Allow enough room on the rod for the lock nut and trim off the rest of the rod. You can check out The Make It Groovy section if you need pictures for this bit.



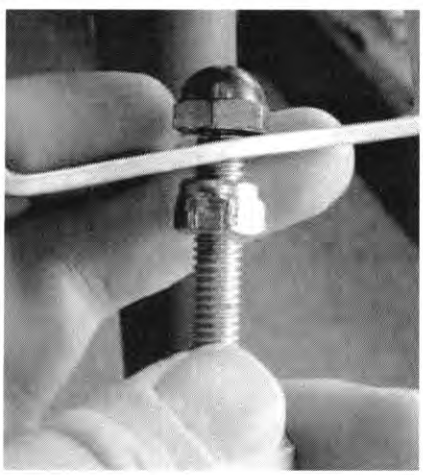


Use a lock nut to screw the base to the bottom of the shaft.



29.

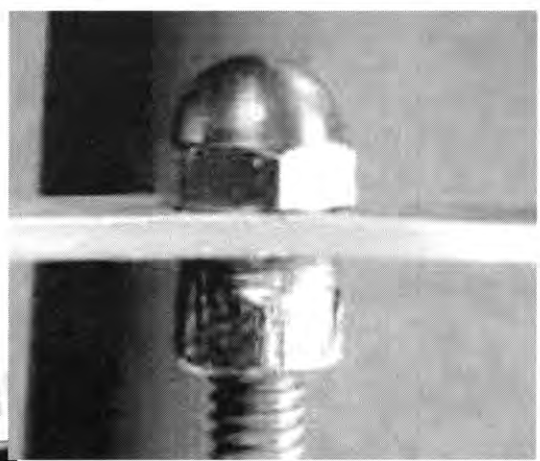
Next we'll attach the handle.
Your bearings should be well adhered to the tube.



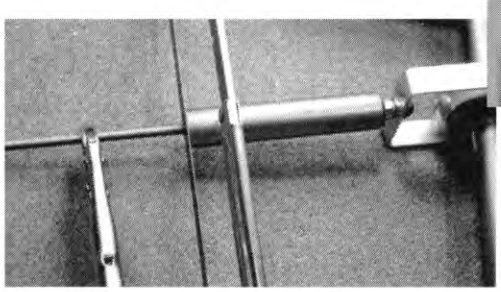
Grab what's left of the threaded rod. Screw on a lock nut down about an inch.

Slide the rod through the hole on the bracket and put on another nut. I used a cap nut in this case.

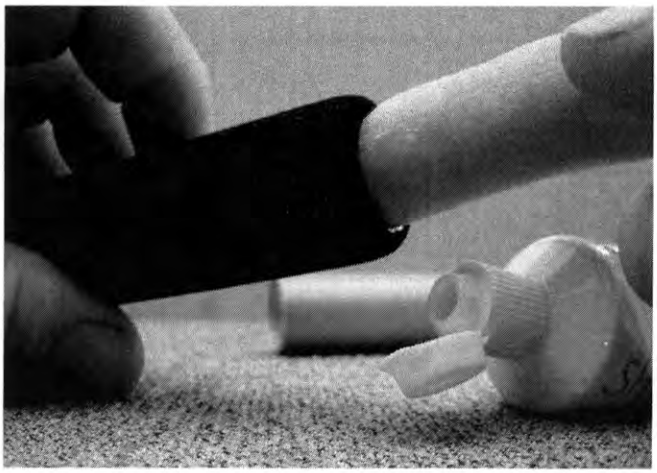
Tighten the lock nut hard against the bracket. We don't want any movement here.

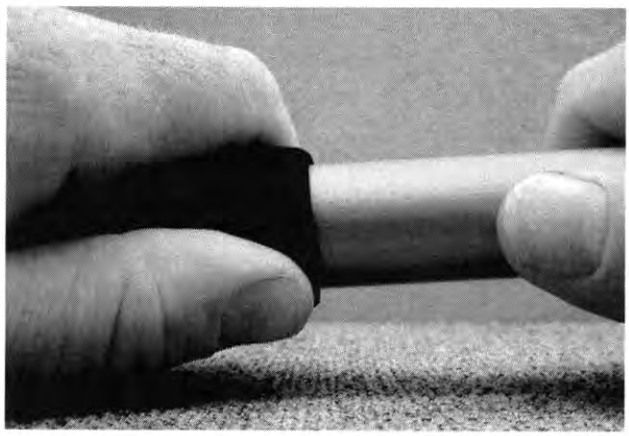


Slide the handle on, and cut the bolt at the base of the handle.



Take some "personal lubricant" and oil up the inside of the foam handle. Do NOT use a petroleum based lubricant. This will eat away at the foam.

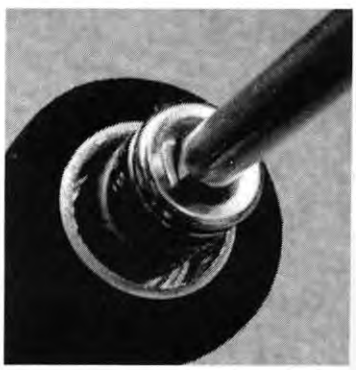




Muscle the foam onto the handle and wipe away any lubricant that oozes out.



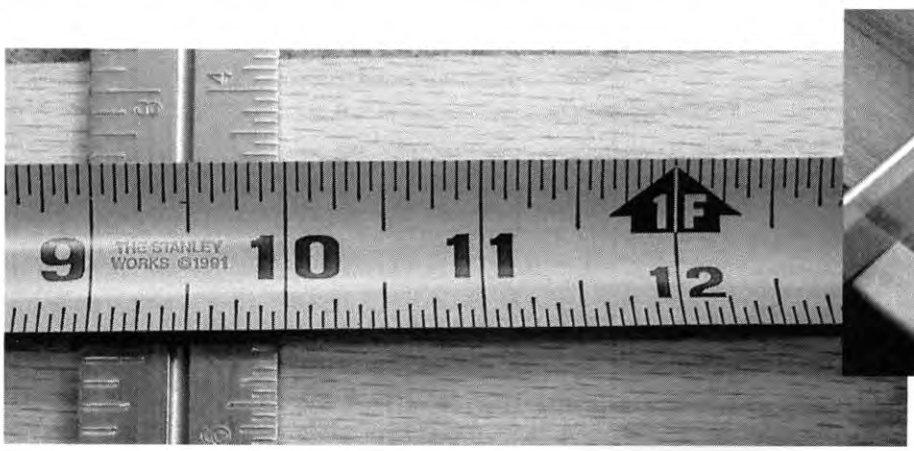
Slip the handle on the bolt and add another stop nut at the bottom of the handle. A socket is a big help in tightening this down. Don't tighten too much. You want the handle to turn without moving up and down.

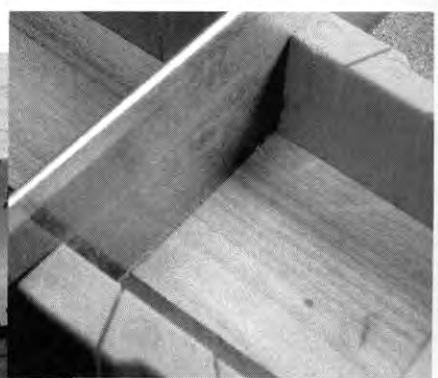


30.

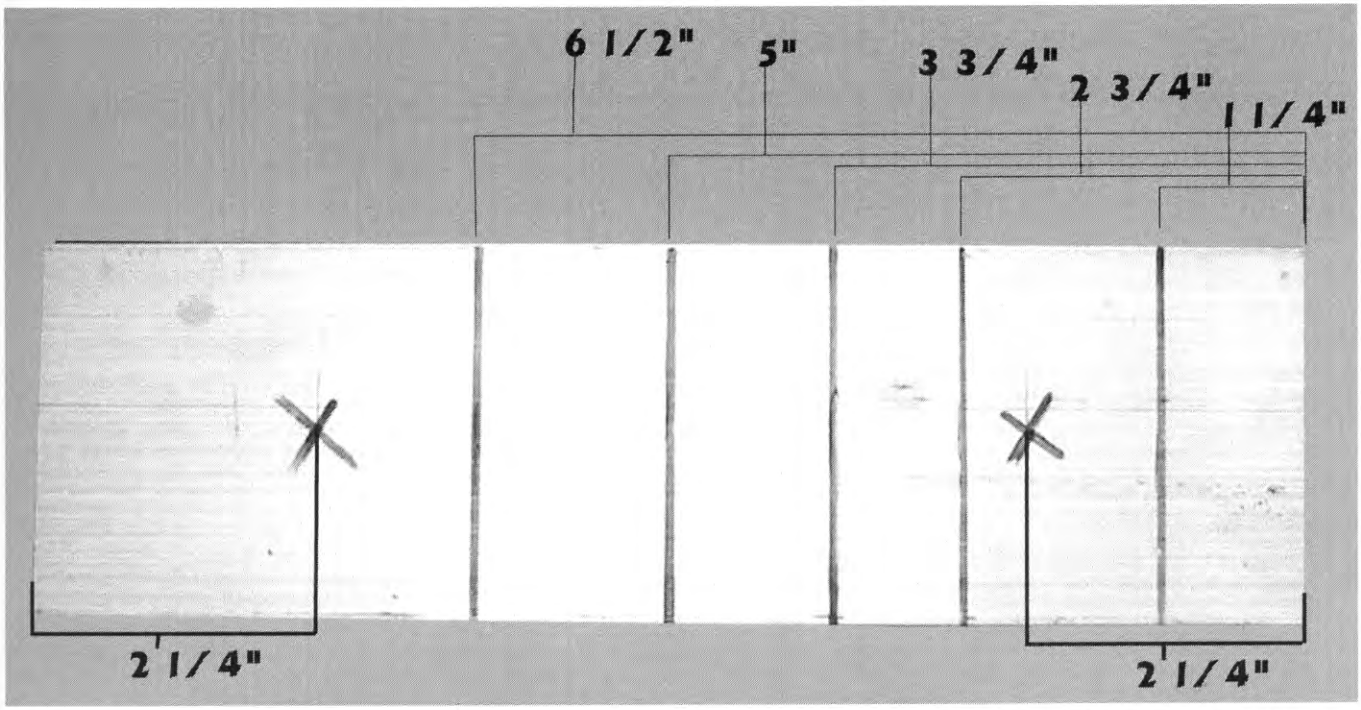
The camera base. See the **MAKE IT GROOVY** section!

Get a piece of 1/4 thick Oak x 3" -4" wide and cut it down to 10" long. I'm using a cheap mitre box to make sure the cut is perfectly square. If you don't want to purchase a mitre box, most home Centers can cut this for you.

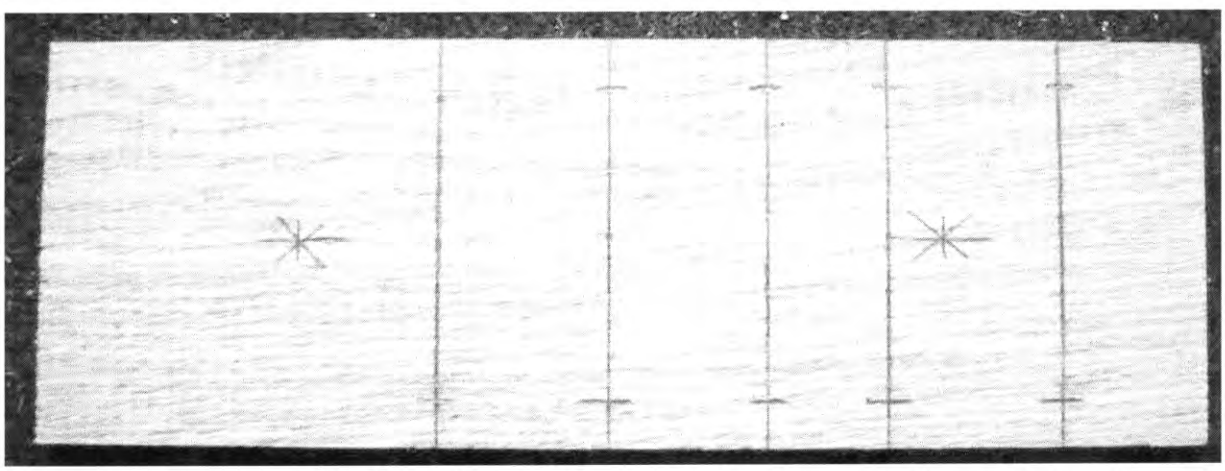




31.



OK, mark up the camera base matching the above photo. (I'm using metal here because it's easier for you to see, but the measurements are the same for wood). The "X" at 2 1/4" from each end is where you will drill holes to attach the conduit hangers. Make sure the "X's" are placed halfway across the width of your plate. I'm using a sharpie to make things more visible for you. It would be a good idea to use your prick punch to scratch the lines into the metal.



Here it is in wood. Notice the little marks that cross the vertical lines? These are 3/8" from the edge and is where we'll be drilling 1/4" holes.

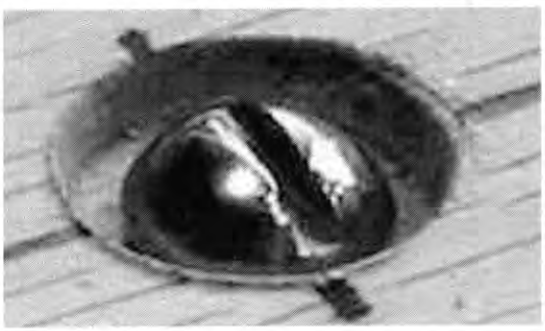
32.

Let's drill some holes.

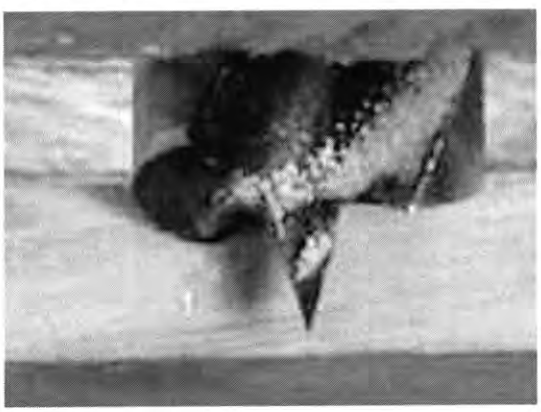
Use a 1/4" bit for all the holes **EXCEPT THE ONES AT 2 1/4 INCHES. THESE ARE FOR THE PIPE CLAMPS AND WE'LL BE DOING SOMETHING DIFFERENT HERE.** This is why I had you make your marks on these holes different from the others.



First we'll drill the holes that hold the pipe clamps. The idea here is make a hole big enough to go around the head of the bolt that holds our clamp, and ONLY deep enough so the bolt head doesn't stick out above the surface of our camera plate.



To do this I'm going to use a large bit that has a guide point on the tip and is slightly bigger than the diameter of the bolt head. I like these bits with the guide point because they're easy to place and they don't tend to "walk".



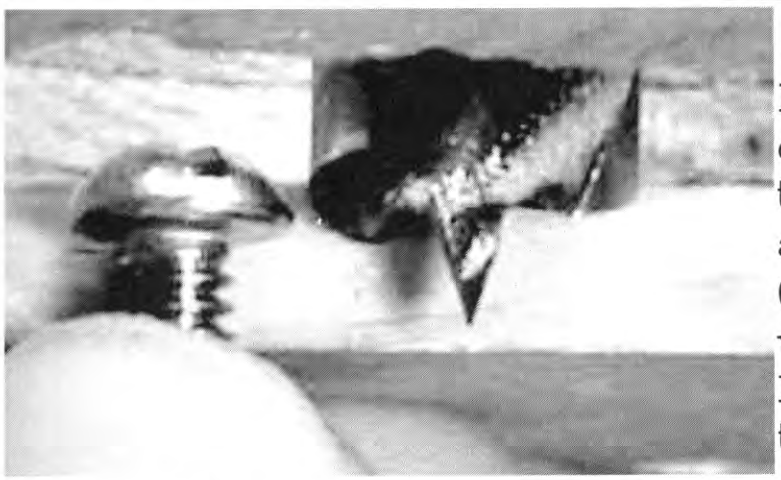
Next we need to determine how deep we can drill without going all the way through the wood (If you happen to do this, you'll have to start the camera plate COMPLETELY over, so take your time and get it right.



There are a number of ways to do this, but I'm going to use this drill guide. I love this thing...the best 30 bucks I ever spent. Get one. You'll use it around the house all the time.



OK, see that little thumb screw? That is a stop, and it will keep my bit from going beyond that point. So the first thing we need to do it to set that stop in its proper place.

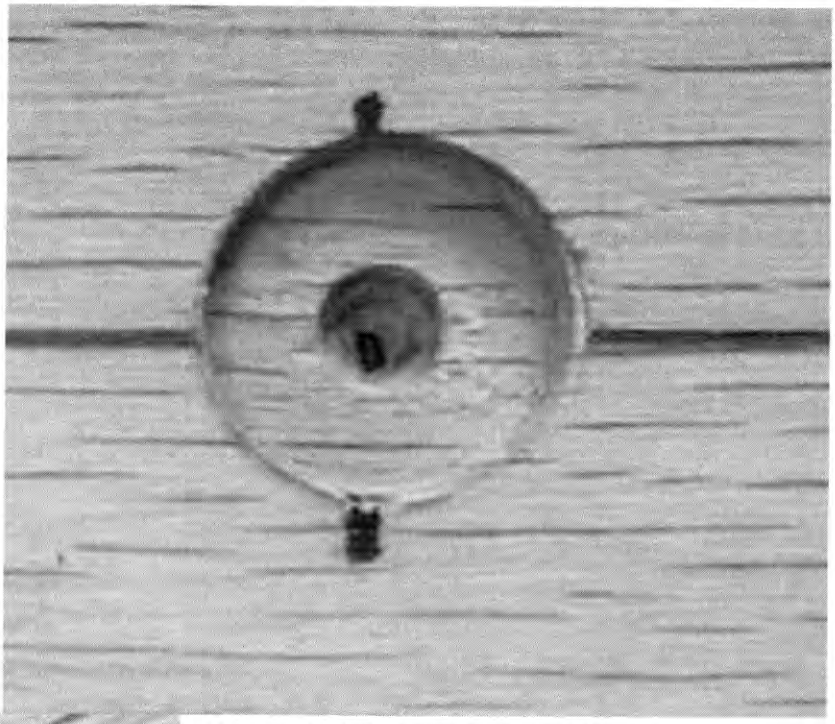


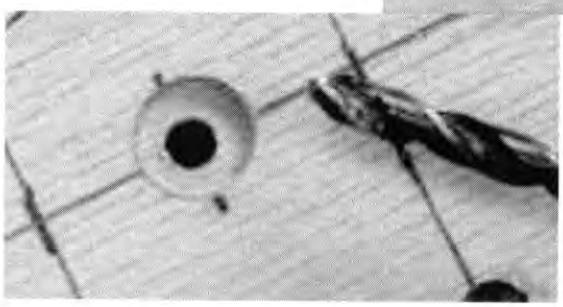
I'm simply going to align the top of the bolt head flush with the top of the camera plate. Then I align the bottom of the drill bit (not including the guide point) with the bottom of the bolt head. That's where I'll tighten the stop on my little jig.

If you don't have this drill guide, they make stops that go onto the bit itself. Just make sure you get the right size for your bit. (In this case 1/2".) Another trick you can do is to wrap some masking tape around the bit at the stopping point. That works great a lot of the time, but I wouldn't recommend it for this particular operation. We're only working with a 1/4" thick board, and it would be too easy to go too deep.

Drill down to your stop and you'll end up with something like this. Beee-u-ti-ful!

Drill another one on the other mark.



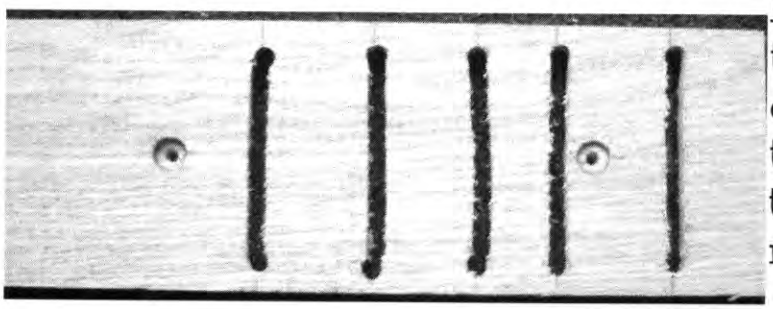


Now finish this up with a smaller hole for the bolt. I'm using a 7/32" bit. This is just a tad larger than my bolt shaft diameter.

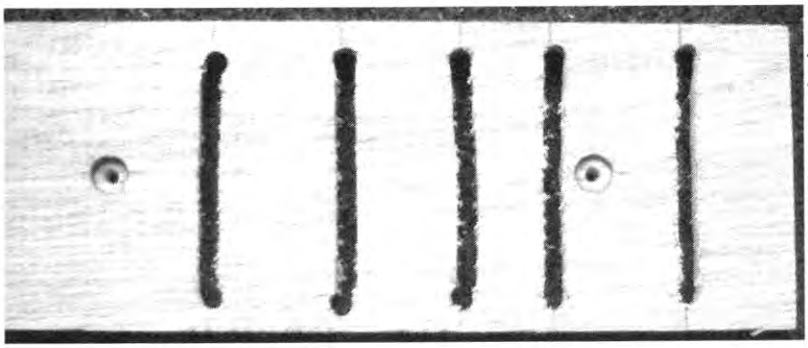
The rest of the holes are for camera placement. Most, if not all DV cameras take a 1/4" bolt, So that's what we'll make our holes.

Use a 1/4" drill bit on the following points you made on your plate:

An Important note: I use a lot of different cameras, so I'm putting a lot of slots. If you are using your own camera, start with the 2 lines from the right of the center. Most cameras work here. Finish making the plate minus the cork and try it out. If it balances, you don't need to make any more slots, or you might find you need a slot across the center of the plate. That's the beauty of building this stuff yourself, custom design! Keep in mind that different battery sizes will shift the weight, so you might want to try it with both long and short run batteries.



Now we have to cut some slots between some of the holes we drilled so we can slide the camera back and forth.

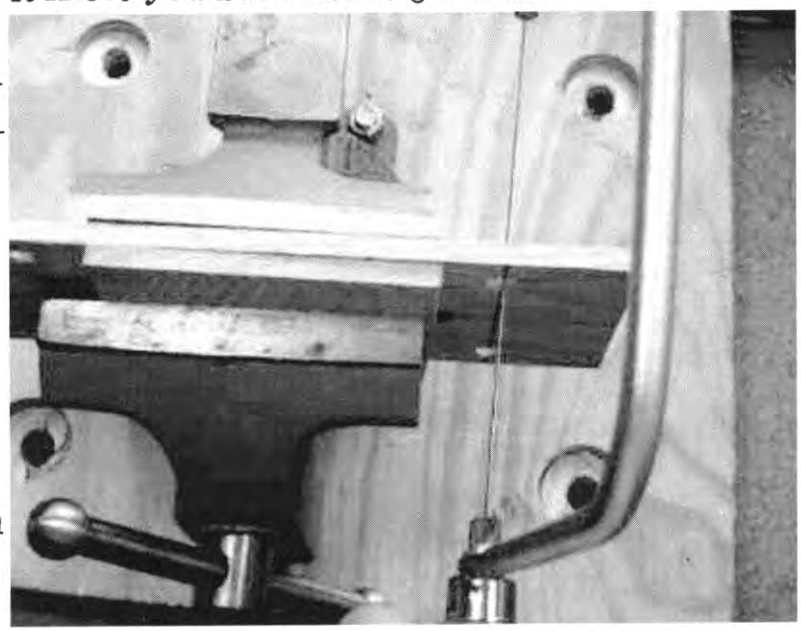


As you can see, they don't have to be pretty.

The best way to do this is with a router. If you've got one, use it. Or you can use the sawing drill bit (see **Make it Groovy**)

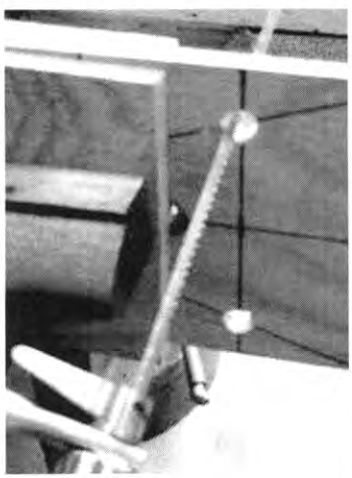
We're going to use a coping saw. It'll set you back about 5 bucks.

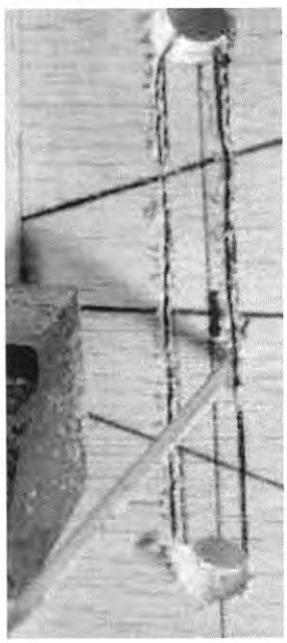
Clamp your plate in the vise in-between 2 pieces of scrap to protect your wood.



A coping saw's blade is removable by unscrewing the handle.

So loosen the blade on one end slip it through the hole on the board and clip the blade back in place.

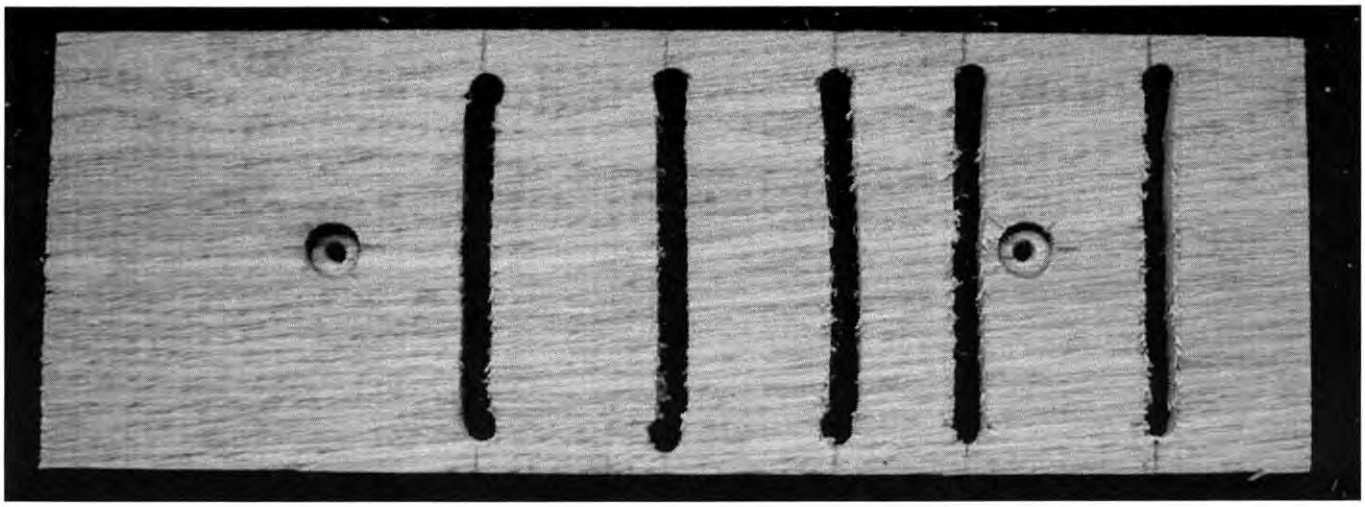




Cut down the edge of one hole to the other, back the blade back up to the top through the cut you just made, and go down the other side of the hole.

A coping saw blade will cut through this oak like butter.

Do this on the other pairs of holes and sand the edges a bit.



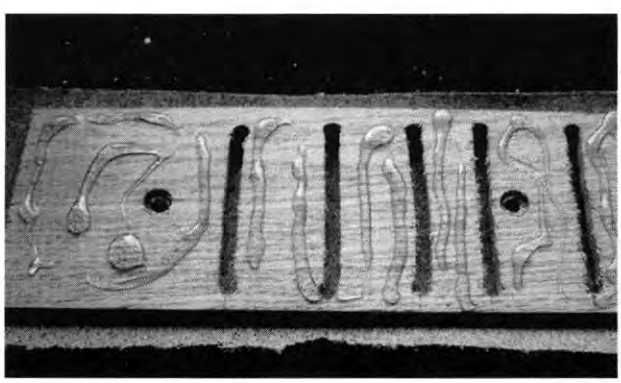
There it is. Don't worry if it's not pretty. It'll still work just fine. Just make sure your camera bolt slides from one side to the other without getting stuck or falling through.

33.

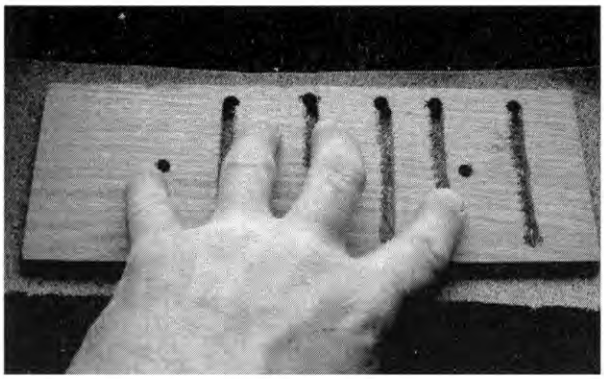
Let's put some cork on the top to help hold and cushion the camera.



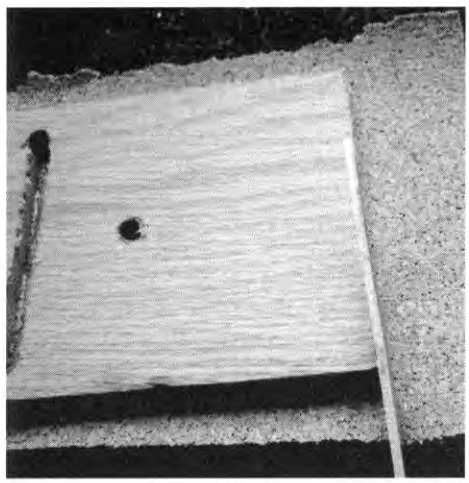
You have the option of using a mouse pad here, but for the wood camera platforms, I really like the cork. Cut a piece of cork off your roll a little bigger than your camera plate. (You can buy a big roll for around $10. It's very handy for covering all sorts of camera platforms.)



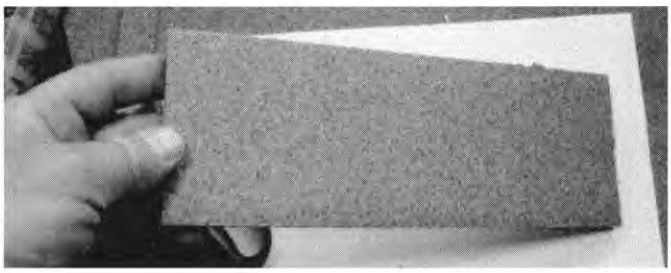
Put some type of adhesive on the top of the plate. I'm using a hot glue gun, but there are a ton of glues that will work. Yellow Carpenter's glue is an excellent choice if you're using cork.



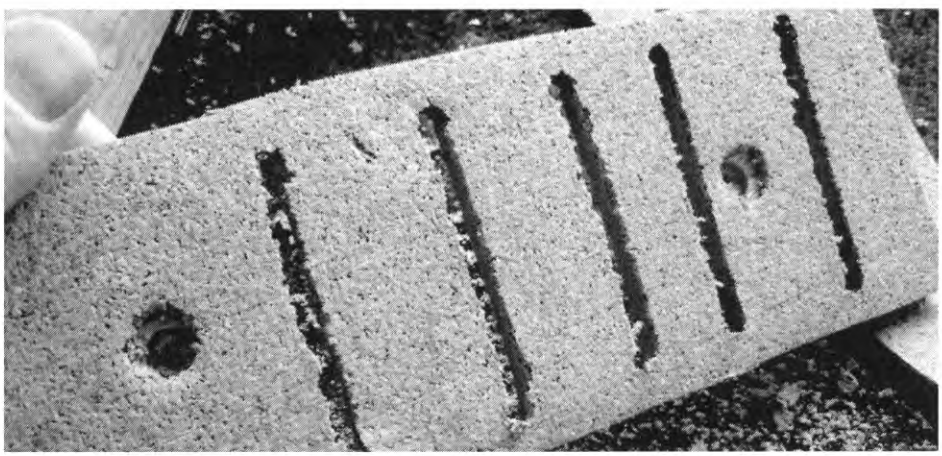
Flip the plate onto the cork and put a weight on it until the glue dries.



Once the glue is dry, trim the excess cork from the edges.

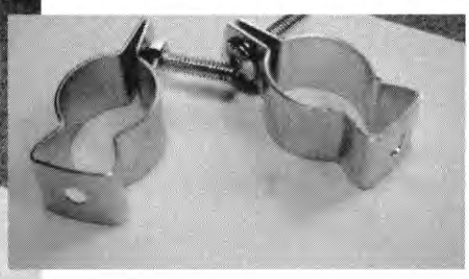


Then trim the cork from the camera screw holes.

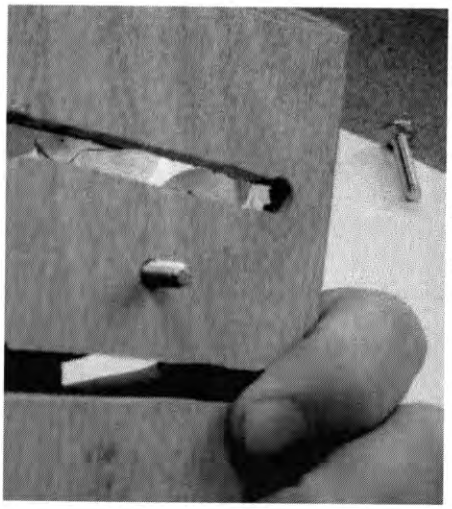




Now let's add the electrical conduit pipe clamps

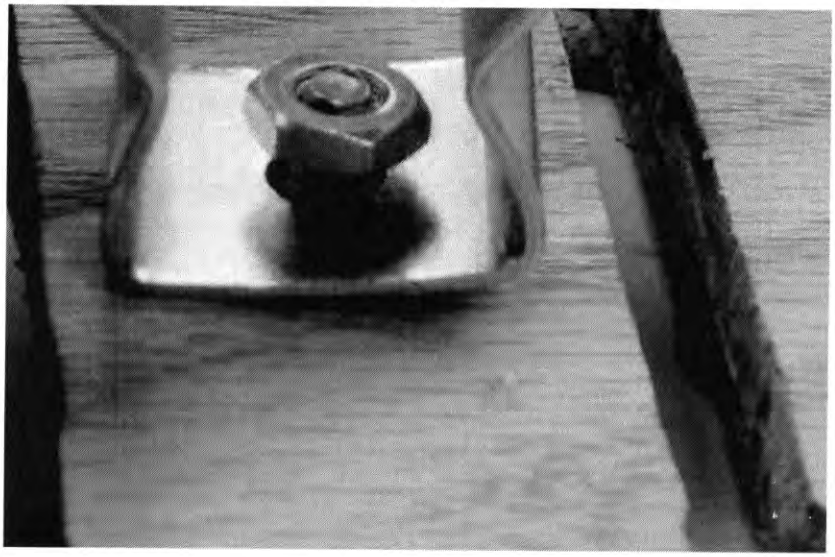


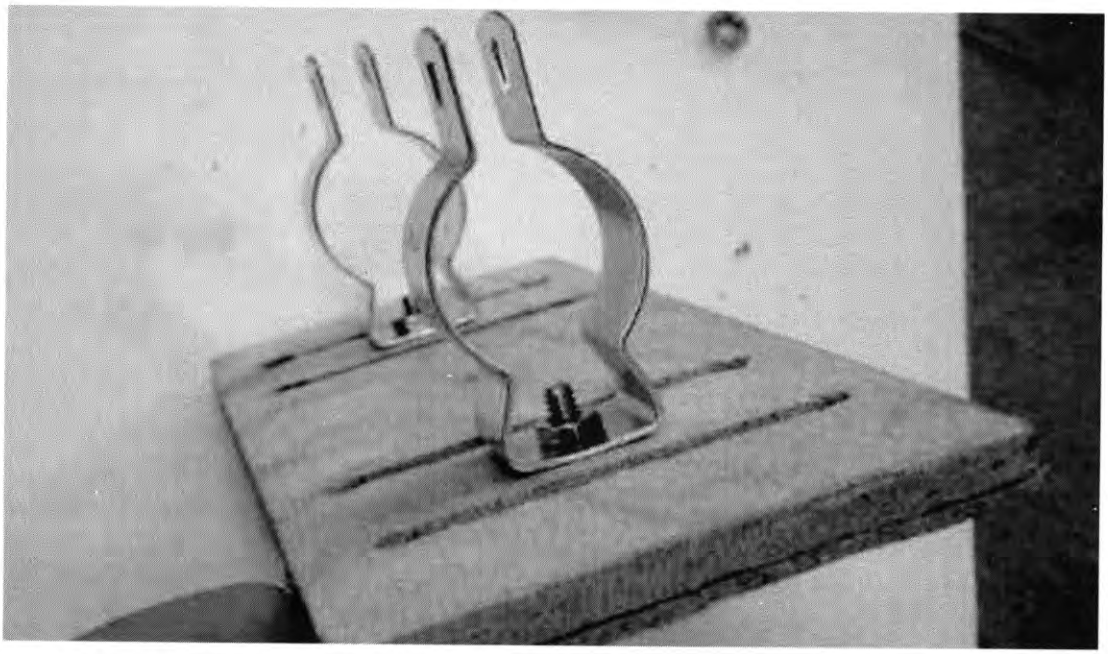
34.



Put a bolt through the hole.

Thread on the nut, add some Lok Tite, and tighten the nut down.



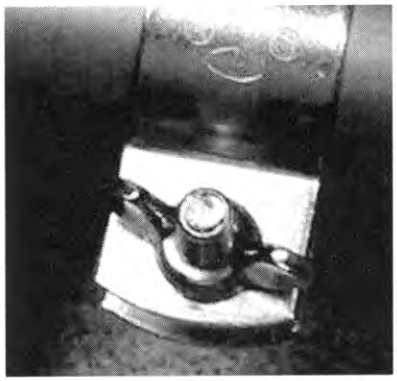


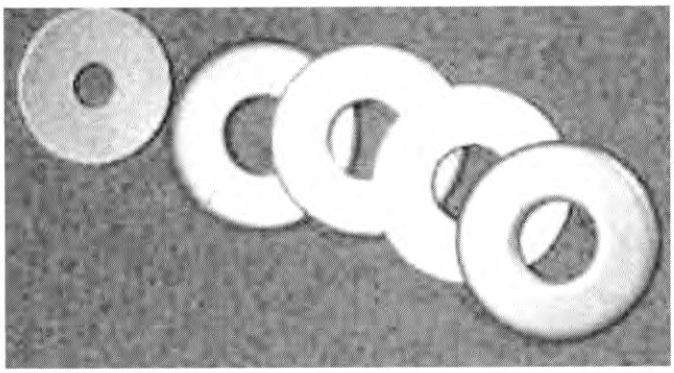
Do this on the other hole and you're done.



Add the camera plate to the top tube.

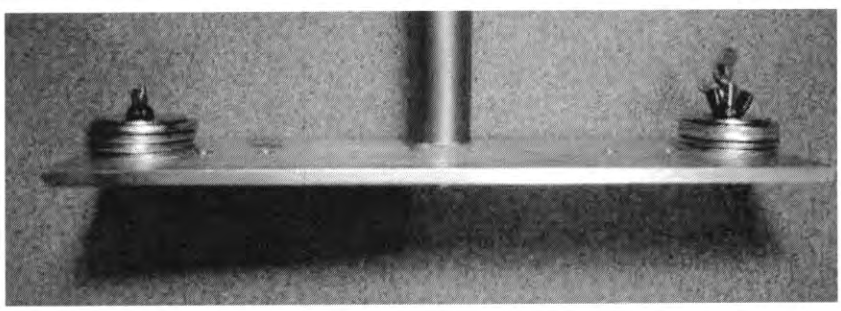
Replace the nuts that came with the conduit hanger with wing nuts.





Grab about 4 big washers and one with a small hole for the top.

Stack 'em and put them on the outermost holes with a bolt and a wing nut.

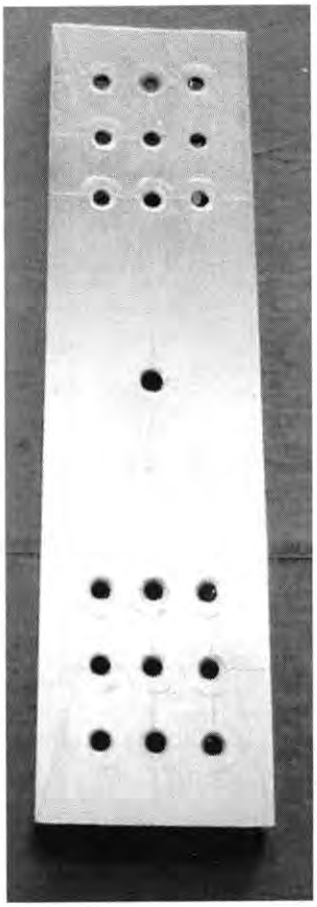


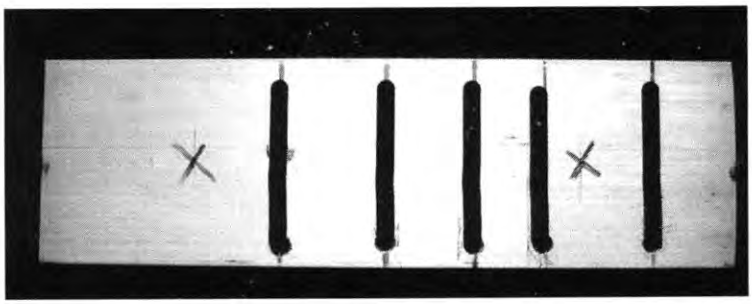
Congrats!
You're Done!



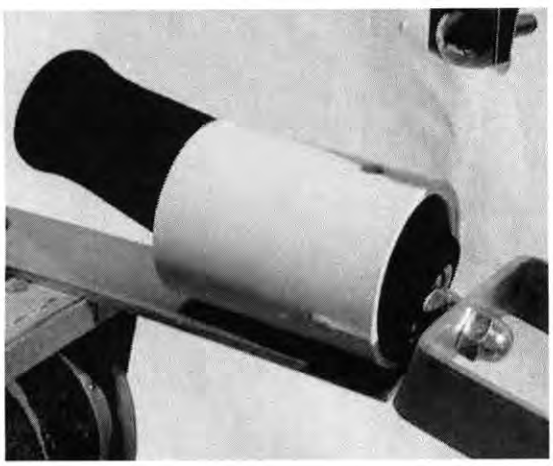
Make it Groovy!

In this section I'm going to show you how to build a base from channel aluminum with a few more balance holes. The channel aluminum simply allows you to set the rig on the ground without it falling over. Can be convenient, but not necessary.





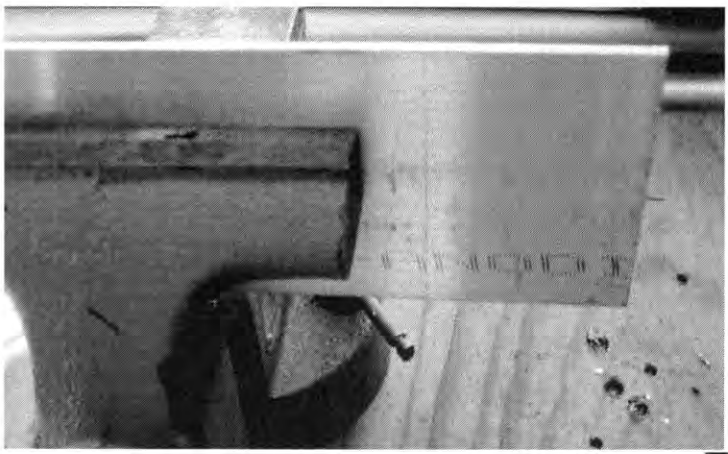
The second thing we'll be doing is making the camera plate from aluminum instead of wood. Sure, it's a little more difficult, but if you're using a heavier camera like a Sony PD-150 or that 24 frame Panasonic, this mount might be a good idea, but again, not totally necessary. I've used the wood plate on the heavier cameras with great success, but I just prefer the metal. It has a better feel on the larger cameras.



We'll also be making this little jig to help you balance your stabilizer.

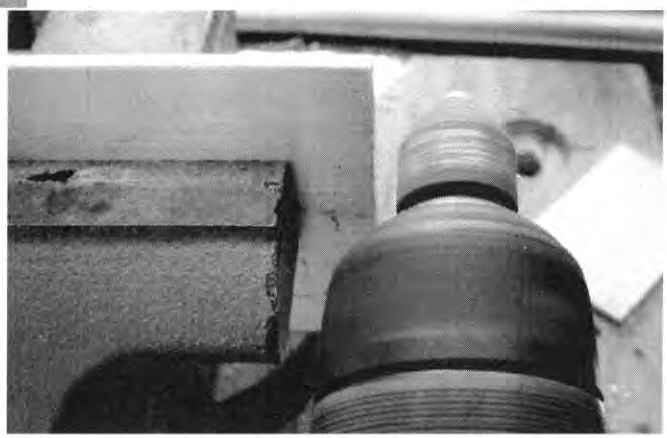
Again, not necessary, just damned handy. (In fact, the commercial versions don't come with anything like this. But for the price, I really think they should!).

How to Make the Camera Plate from Aluminum

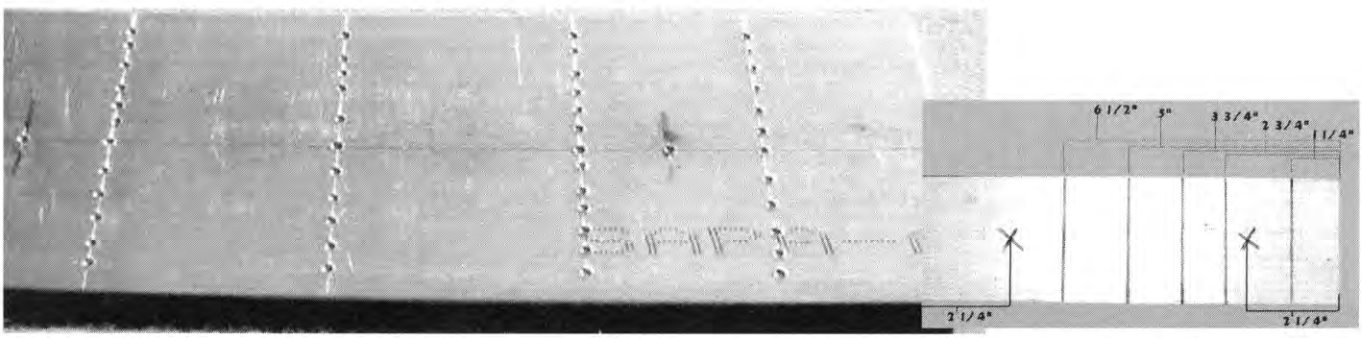


Trim a 1/8" -1/4" thick by 3" to 4" wide piece of aluminum to 10" long.

Put a grinding bit in your drill, or use a metal file and smooth out the freshly cut edge. I like using a file for this, but whatever floats your boat.



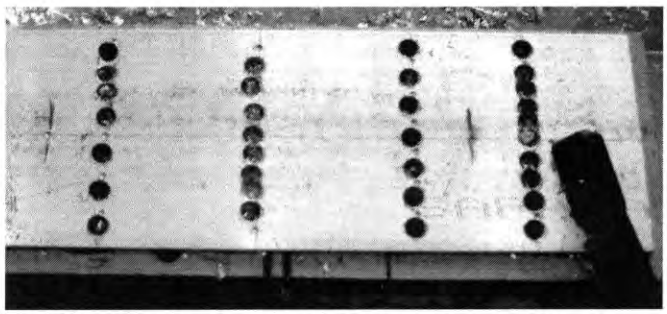
Mark up this base just like the wood one. Keep in mind, most cameras will work on the center slot, the next one to the right, or the far right. Start with these, and if your camera won't balance on the forward/back axis, make another where it will. (This is usually somewhere between the two middle ones).



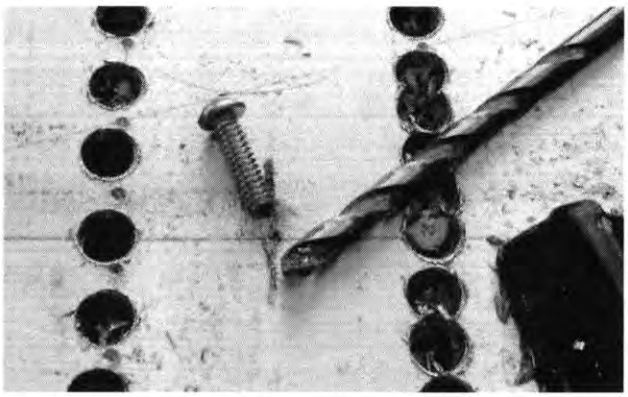
Remember, since this is metal, scratch your lines in with a prick punch. Then along the lines, take your center punch and hammer dimples along the line at about an 1/8 inch apart. Don't forget to make the dimples for the conduit hangers as well.



Clamp your marked up plate to your bench on top of a piece of scrap wood

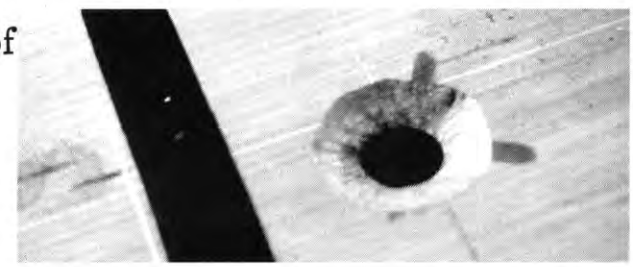


Use a 1/4" drill bit to drill a hole in each of the dimples. Don't forget to use drilling oil! I know, it doesn't look pretty, but we're not done yet!



Now drill the holes for the conduit hangers. You want to use a bit slightly larger in diameter than the screw. In this case, I'm using a 7/32" bit. So if you're copying my rig down to the last nut, you should too. But if your bolt is a little bigger that's just fine, too.

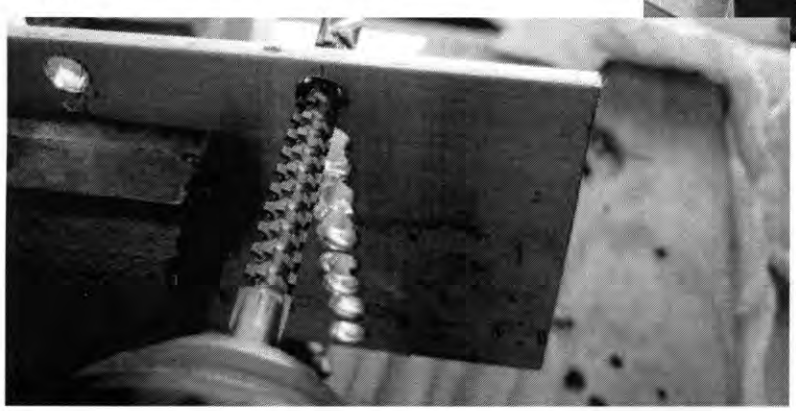
NOTE: If you're going to use cork instead of a mouse pad, you'll have to counter sink the conduit holes. Just get a big 1/2" bit, and slowly grind away until you get something like this:



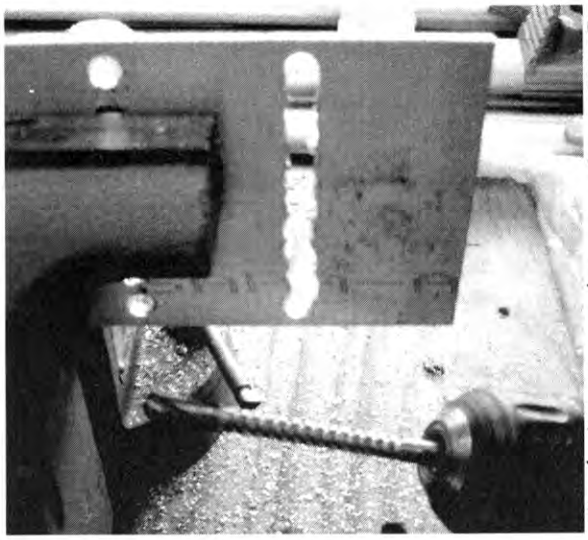
Now we need to make all of those holes into a slot.

Clamp the plate in your vise, and grab the drill bit that acts like a saw.





Start in the top hole and use a little force to cut away the aluminum between the holes. Obviously, the closer your holes are to one another, the easier this part is.

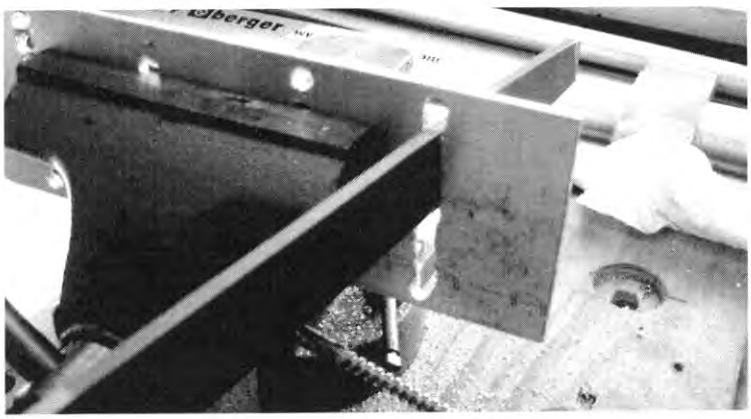


Once you've got your slot cut, take a metal file and file down the rough spots.

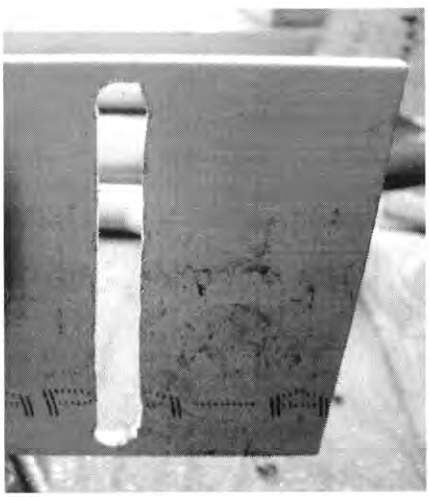
You'll have a couple of choices on files:

A **Single Cut** or **Mill File** makes a smooth finish but will take longer than a Double Cut file. If you want to spend the money, get both. Start with a Double cut and finish up with a single cut. It really doesn't matter in the operation of the stabilizer.

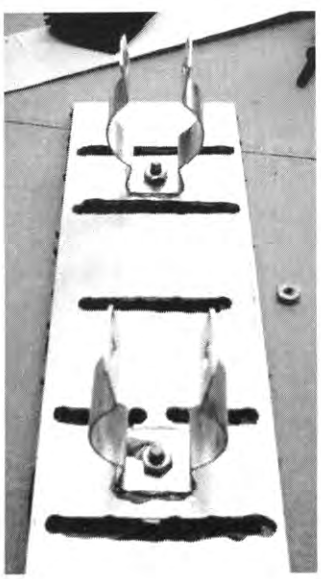
Now, don't go grinding this file back and forth. Use both hands and file away from your body, Take off the pressure, bring the file back and go again. **Make sure you wear Safety Glasses!**



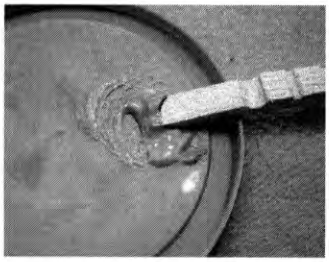
Ohh, Pretty. Now finish up the rest of the slots the same way.



Grab your conduit hangers and the nuts and bolts to attach them.



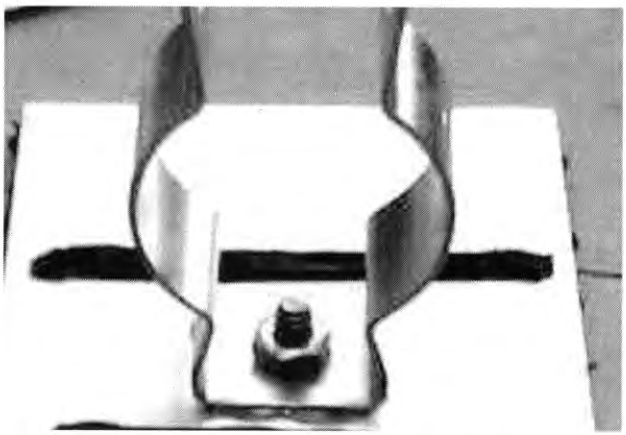
OK, let's add the conduit hangers.
Unlike the wood platform, we're going to attach these babies permanently with JB Weld. I love this stuff!



Mix up the two parts of JB Weld



Spread a thick layer on the top of the conduit hanger.



Take your nut and bolt and tighten the conduit hanger down on the plate.

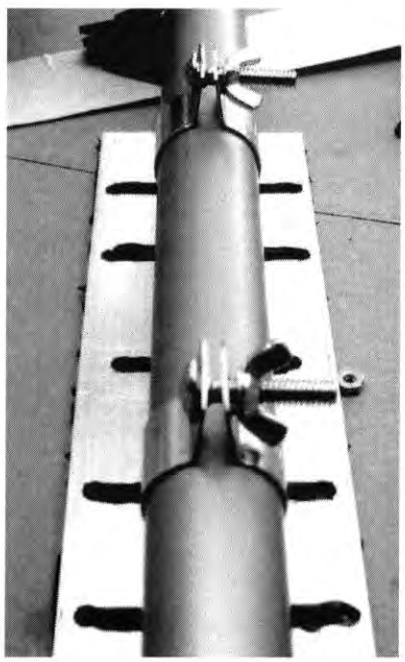
Do this with the second hanger as well.

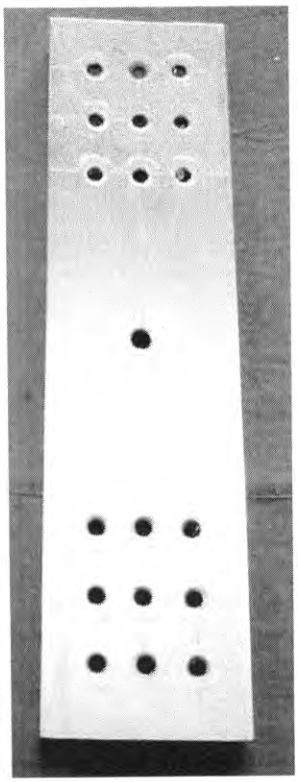
Take a length of the large 1 1/4" OD and tighten it into the hangers.

We're doing this to make sure that the hangers are straight with one another.

You obviously want to do all of these steps fairly quickly, before the JB Weld dries.

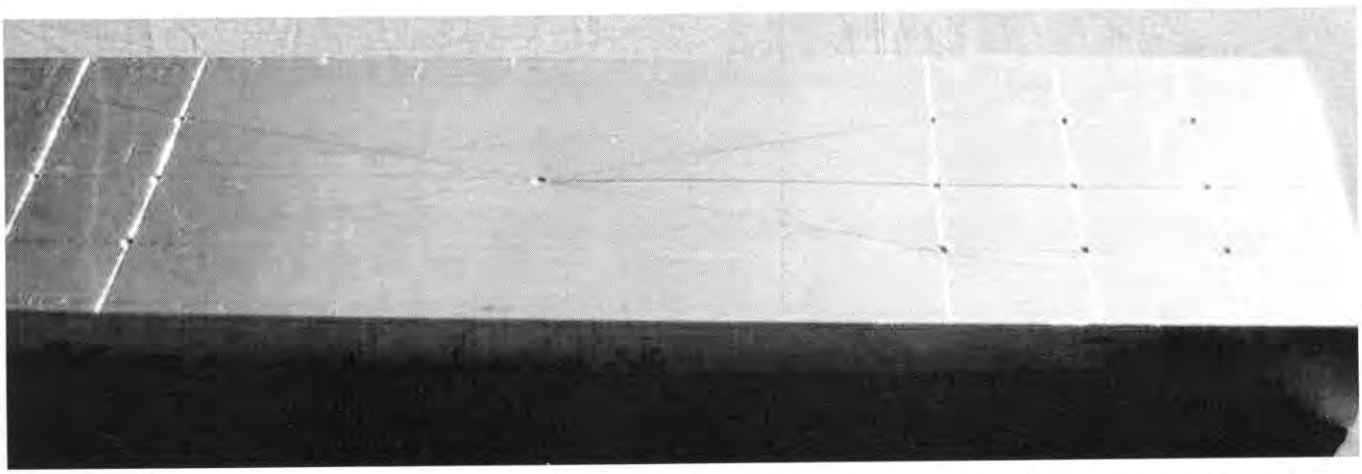
Set it aside to dry for 24 hours.





While the camera base is drying, let's make the counterweight base!

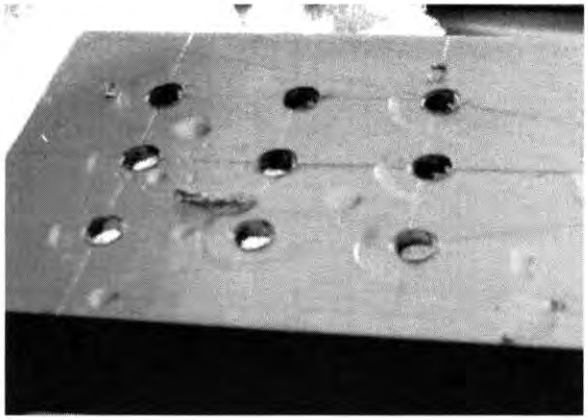
As you can see, there are a lot more holes for your counterweights. 99% of the time, you'll use the ones in the center, but the side ones can come in handy if you, say, add a big mic to the camera and just can't get the thing to balance.



First, use your prick punch to mark up your aluminum. Do the same measurements for your holes as the flat base and use your combination square to draw a line across each of your middle hole marks.

Measure in about a half inch from the side and make another mark on the line. do this on each end and on each side.

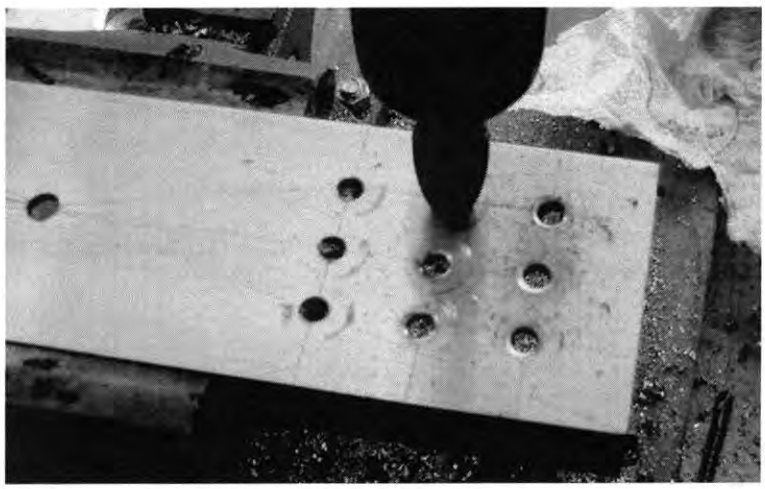
Take your punch and hammer and make dimple on each of those marks. It should look something like the above photo.

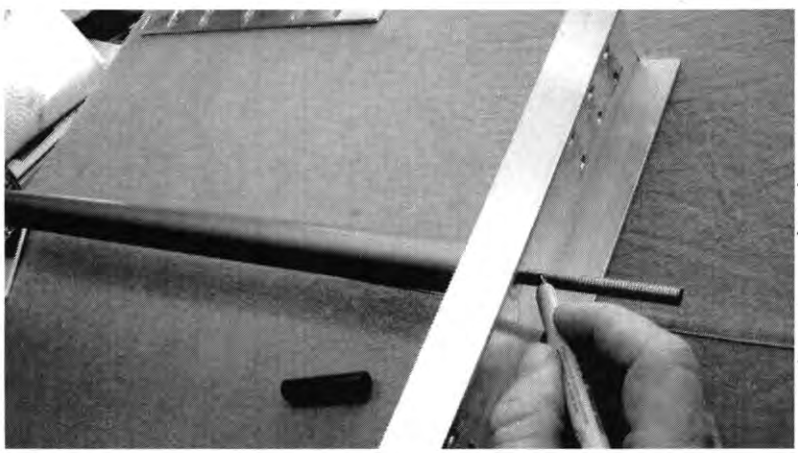


Use a 1/4" bit to drill the holes for the counter weights.

Use a 5/16" bit for the center hole where the base attaches to the rest of the rig.

Once your holes are drilled, load a grinder bit into your drill and smooth out the holes on both sides of the base. The burrs from the drilled metal can be really nasty on your fingers. If you don't have a grinder bit, you can use your metal file.





Slide the base onto your rig and mark the threaded rod, leaving enough room to add your nut, but not so much that it extends beyond the sides of the base.

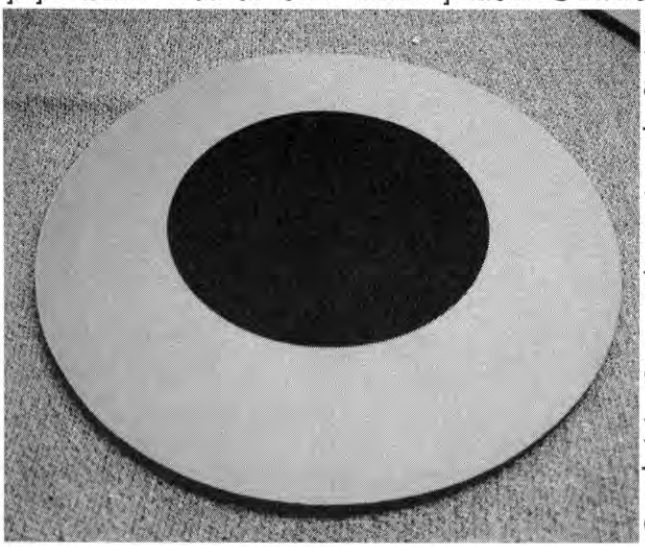
Remove the base and trim off the excess rod with a hacksaw.

You'll probably have to smooth out the end cut rod with a file to get the bolt on.

The rest of the steps is just like the basic rig.

Making the Mouse Pad...well, pad.

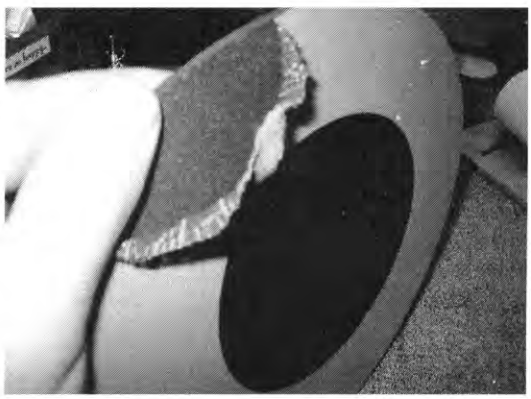
If you're making the metal camera plate, you've got to use something thick like this. Why? Because on the wood, we could counter sink the holes that hold the pipe brackets to the wood plate. Counter sinking holes on metal isn't the most pleasurable thing in the world, so I like to avoid it. That means the little bolt head will be making little bumps on our plate. Don't want that. So by using a thicker material like this mouse pad we can avoid that messy business.

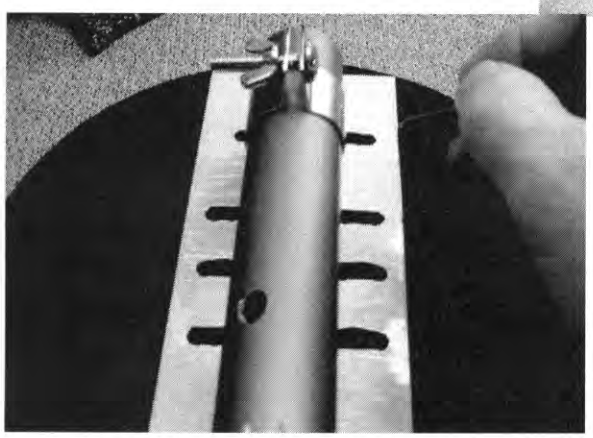


Go to your computer and grab your mouse pad. Come on, you wanted a new one anyway. I'm using a circle, but the rectangle ones are easier to deal with.

Start by ripping the cloth cover off the rubber part.







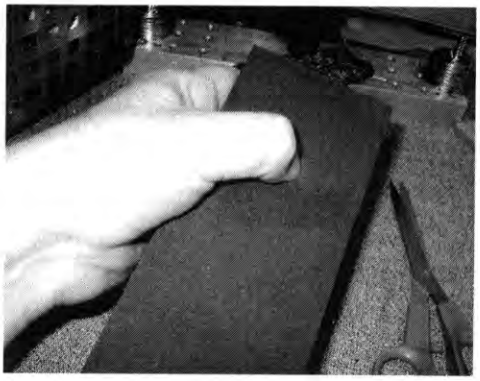
Lay the plate on the pad and trace around it. You might have to make two pieces if your mouse pad isn't long enough.

Take a pair of scissors and trim the pad to size.





OK, here's that troublesome little screw head. Lay your pad on the plate and feel around for it.





Then mark that spot. I just used a pencil to punch a hole in the pad. Do this on the other screw head as well.

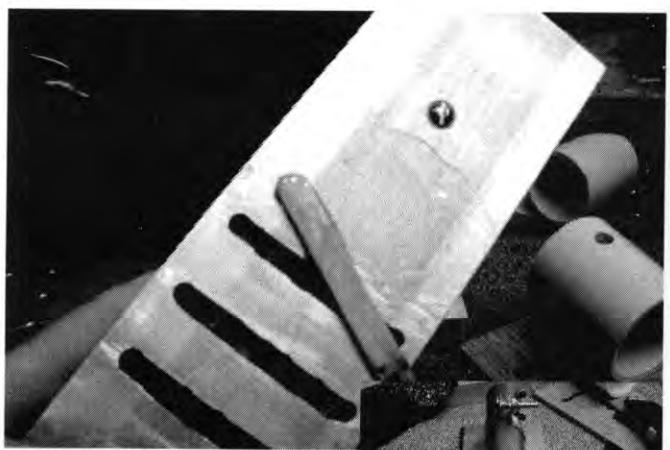


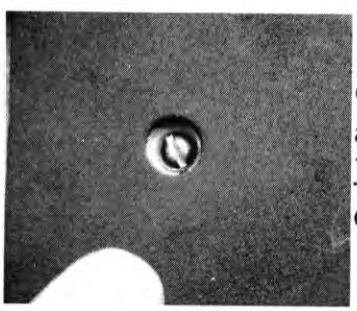
Cut a hole in the pad where you made your marks big enough to surround the bolt head.



The thing I'm using is a cutting tool that comes with a grommet kit. It's just a circle punch that I'll thwack with a hammer and out comes a perfect hole.

Remember the Epoxy you used on the wheel part of this rig? Mix up a good sized batch and spread it over your camera plate.



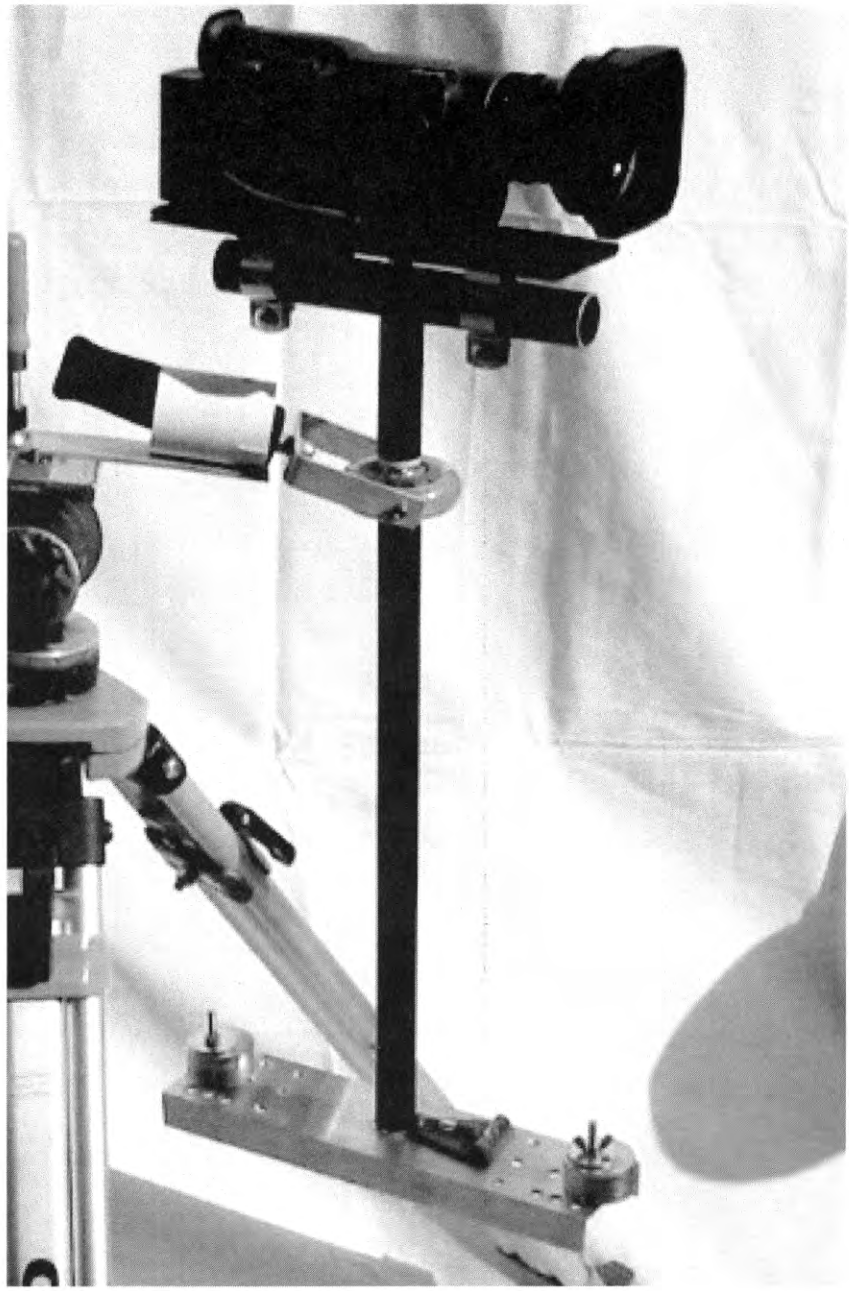


Line the hole up over the bolt heads, and set the whole business aside to dry.



Once it is good and dry, trim away the mouse pad that is covering the slots.

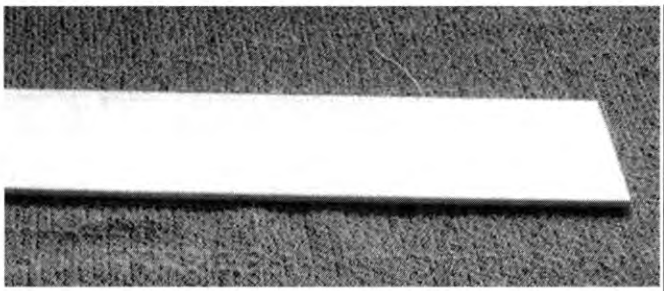
The Handle Cradle



The Handle Cradle is a very simple device to hold the rig between shots, to help adjust the balance, and anything else you can think of.

Keep in mind, you don't absolutely need this little gizmo, but it's so easy to make, why the heck not?

Materials list



You're going to need a piece of wood or aluminum to attach the PVC pipe to. It should be around 6-8 inches long by 1.5 to 3 inches wide. I'm using aluminum simply because I have some left over from the pooper-scooper cam.



This is a connector piece to link 2 pieces of PVC pipe together. It's in the plumbing section. You need to get one just large enough to fit your handle in. This one is 1.5 inches in diameter by 3 inches long.



A flat head bolt with nut by 1/2 inch long.

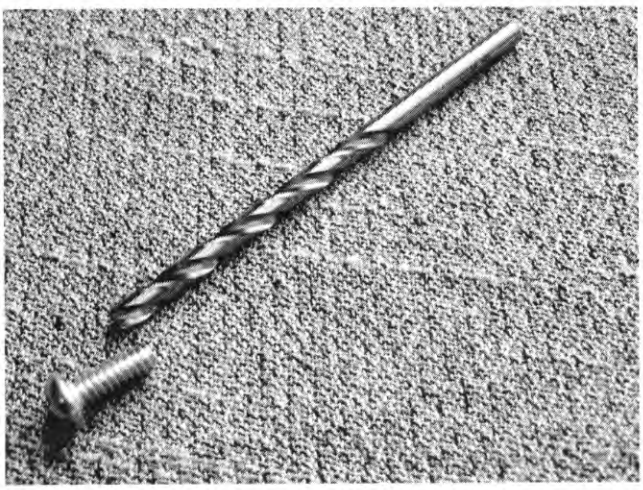
Tools list



A screw driver.



A bit large enough to make a hole to fit the screw driver through.



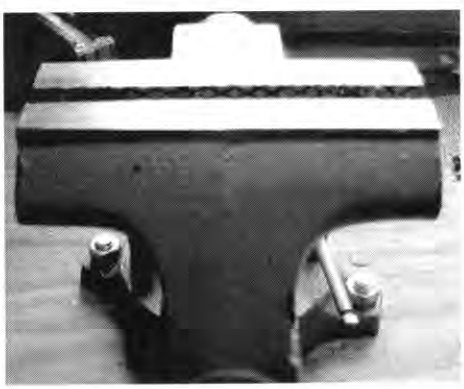
A drill bit large enough for your bolt.



A drill.

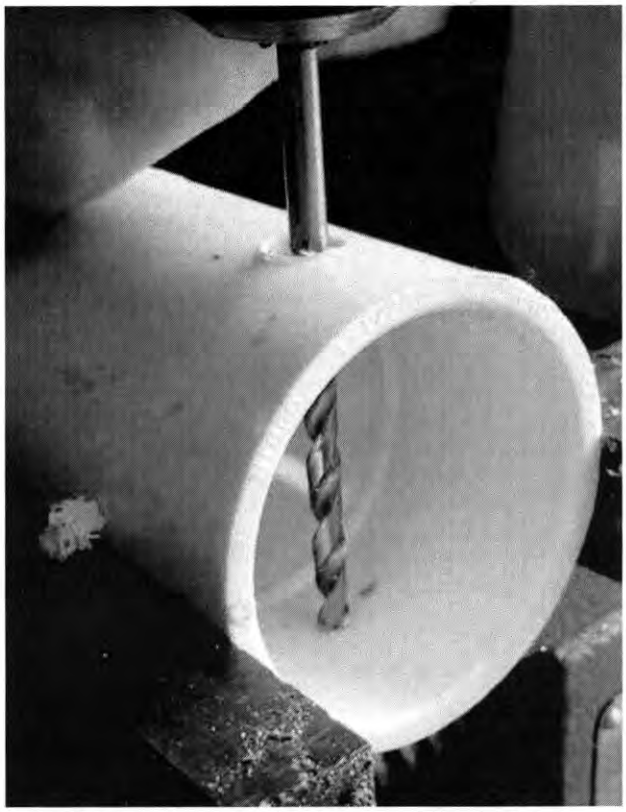


A ruler of some sort.

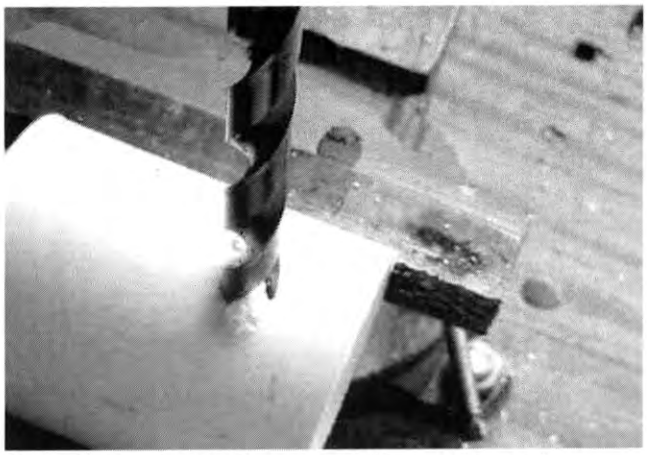


A vise or clamp for your work.

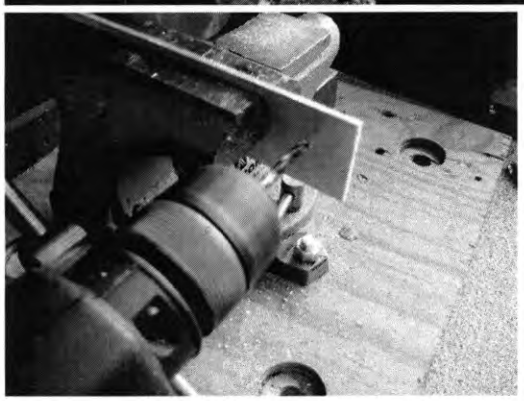
Let's build it



Clamp down the PVC pipe, take your small bit and drill through both sides of the pipe.



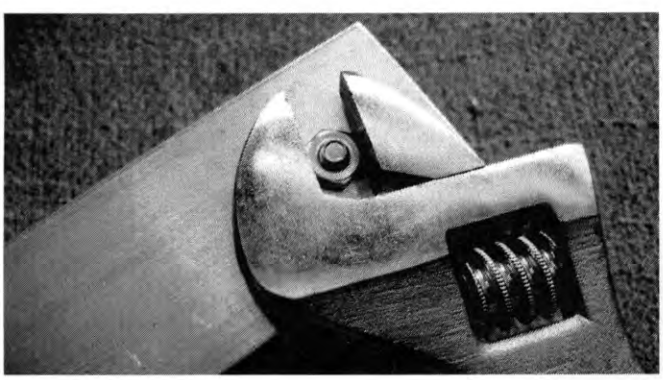
Load up your larger bit, and make the top hole a little larger.



Use the smaller bit to drill a hole in your aluminum or wood strip. This goes dead center and about 1 inch from the end.

Stick the screw driver down through the larger hole and screw the bolt into the smaller hole.



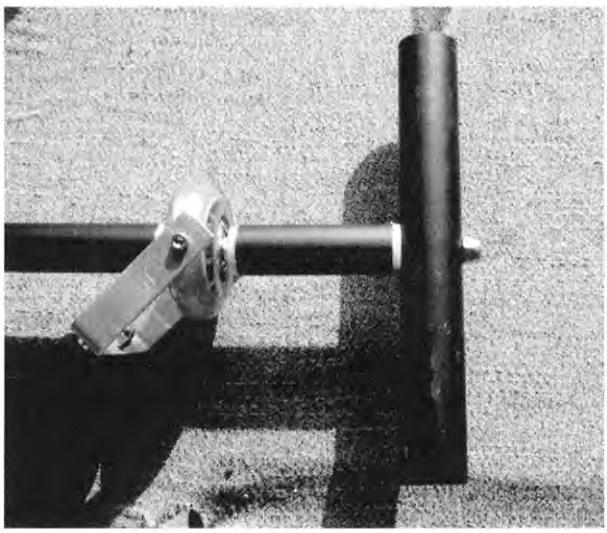


Then run it through the hole on your wood or aluminum strip and tighten the nut on and you're finished.

See how easy that was?

How to balance your new Stabilizer

A word of warning: Until you get used to this process, the first few times will probably be frustrating and take forever. This is a very sensitive device, and unlike the commercial versions, this one has a rotating handle, which makes it a little tricky to balance, but isolates movement much better when you're actually using the thing. In other words BE PATIENT.



This first little trick isn't absolutely necessary, but it'll make things easier in the long run.

Because the camera plate is on conduit hangers, the plate can tilt left or right. Which is great for dutch angles (remember the old "Bat Man" tv show?), but most of the time we want the camera plate to be dead level.

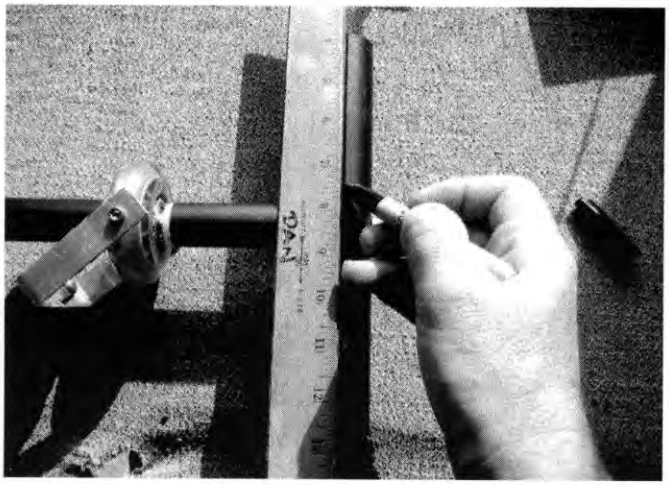
So pop off your camera plate and lay the rig down on it's side.

Grab a compass--the pointy dangerous ones we used in grade school are just fine for this--and put the pointy end against the side of the top rig tube. The pencil end should rest somewhere near the top center.

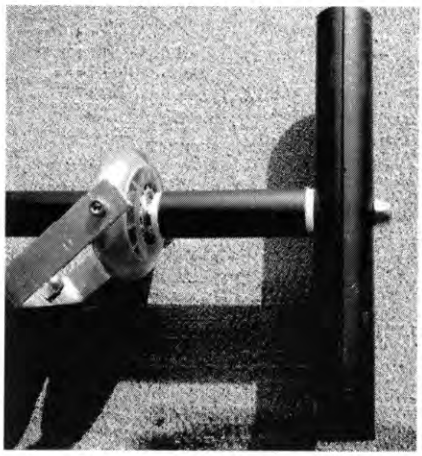


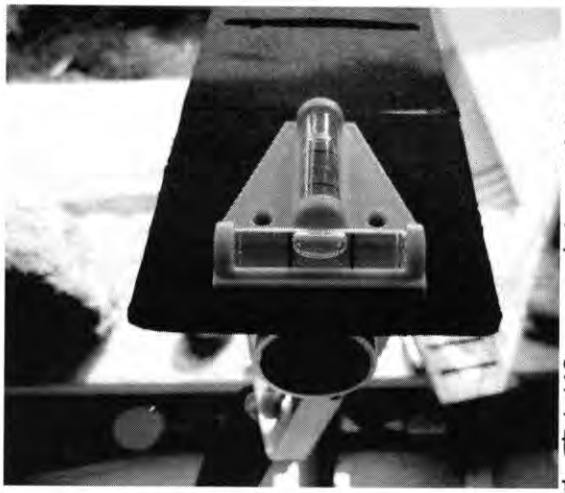


Pull the compass along the tube. The pointy end along the side of the tube will help keep your pencil mark on the same plane.



Next, hold a ruler or straight edge along the pencil line and mark a permanent line with a sharpie.





Put your camera plate back on your rig, Then set the whole thing upright on a **LEVEL SURFACE!!!**

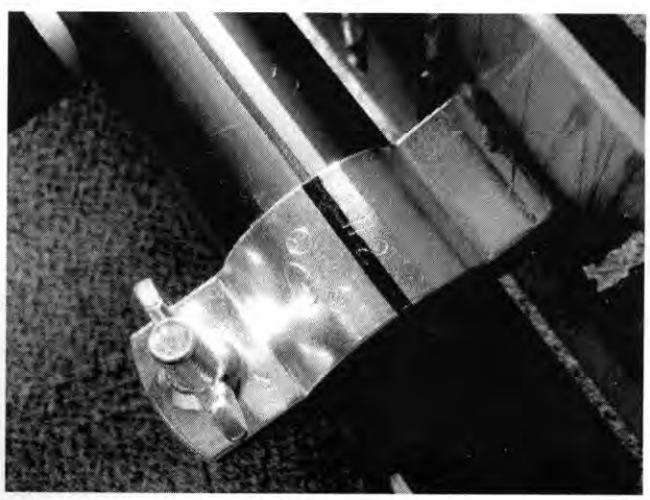
Next, set a level on the camera plate.

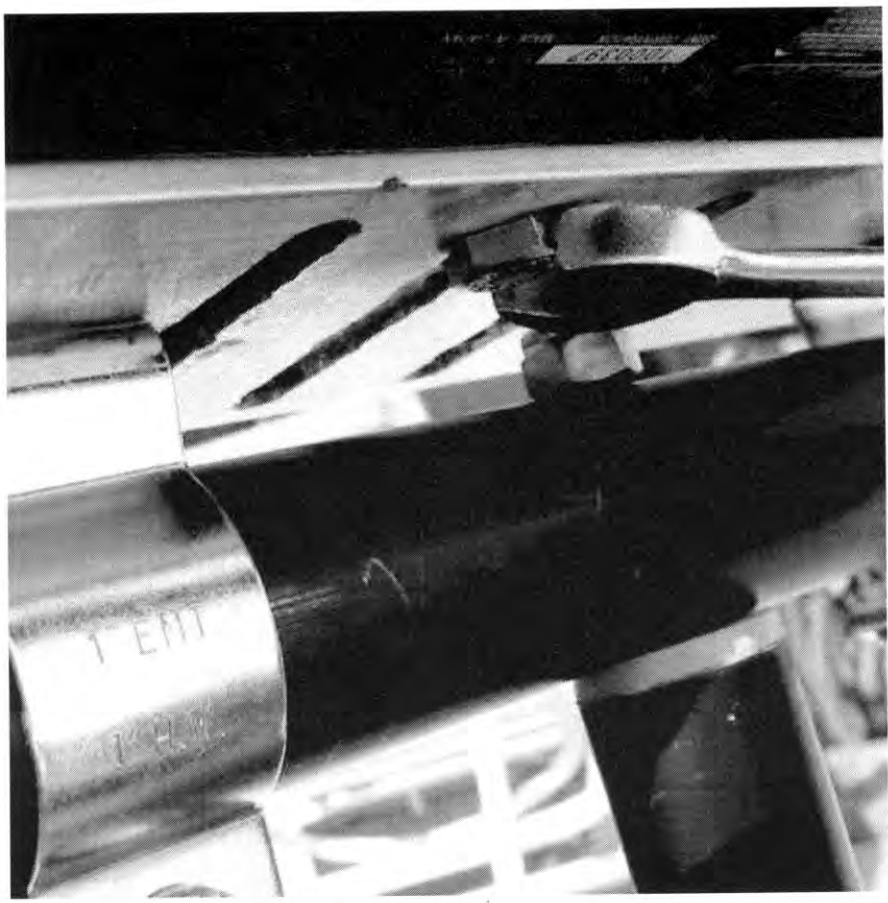
I'm using this little combination level that gives me all directions at once. This works like the square bubble level with a circle in the center, but this one is only 3 bucks and really easy to find. I got mine at Lowes. If you're doing anything where the camera is mounted on something (tripod, car mount, etc) you need a level that works in all directions.

Loosen the hanger nuts and adjust the camera plate until you have it perfectly balanced with the bubble dead center on your level, then tighten the whole thing down.

Take your sharpie and draw a line on each of the conduit hangers matching the line you marked on the aluminum tube.
Now all you have to do is line the marks up, and you're level.







Alrighty then. Take your camera and attach it to the plate with your camera bolt.

I like using an allen head bolt or a hex bolt. This makes it easy to get a tool in there to tighten it down.

In to which slot you attach your camera depends on the type of camera, the size of the battery, etc. This one is a Sony PD-100, so the slot I'm going to use is the second one from the rear conduit hanger, near the right side of the plate. Don't tighten the bolt down too much at this point. We'll be shifting the camera left and right.

Now let's see how we're doing, balance-wise, that is.

Set the camera on a level surface. If you're using a flat piece of aluminum for the base, you'll need to set it on a couple pieces of wood so the bolt heads that hold the weights don't touch the ground.



Take a close look at the picture at the right. Make sure your base and the camera plate are in line with one another.

If you're using a camera with a fold out monitor, open it. Also, take off any hanging lens caps and straps, and put on the battery you'll be using. I STRONGLY suggest you use the smaller battery. The long rage batteries are a killer to haul around (eventhough I'm using one here!)

Now lift the rig by the handle (just a bit) and see which way it falls on the left/right axis. If it falls to the left, move the camera right and visa versa. Monkey around until you're close. It doesn't have to be perfect...YET.



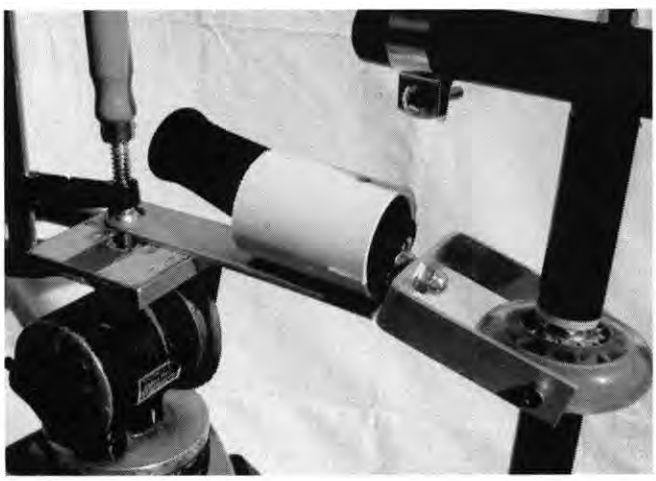
HEY! HOW MUCH WEIGHT DO I PUT ON THE BASE?

Glad you asked. Pick up the rig by its handle, and hold it in front of you. Grab the center column tubing and move it so it sits horizontally.

Let go.

It should take 1.5 to 2.5 seconds to right itself. Keep in mind, we've only sort of balanced the left/right axis, so your camera may fall a little wacky. That's OK. We're just checking to see how long it takes to drift upright before it stops. If it moves too fast, you'll need to take off some of the weights (equally on front and back, please). If it doesn't move at all, or too slowly, you'll need to add more weight to the base.

The bigger your camera and battery, the more weight you'll need. Which in turn, will wear you out MUCH quicker. Try to keep things as light as possible.

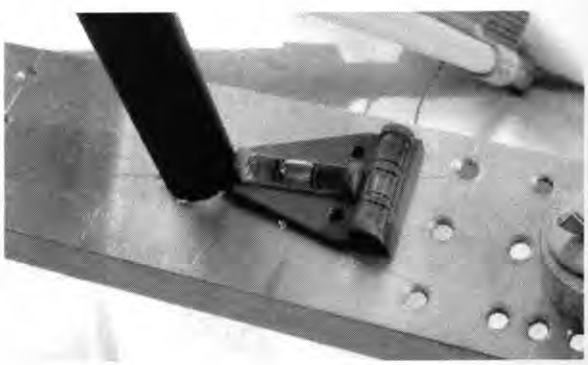


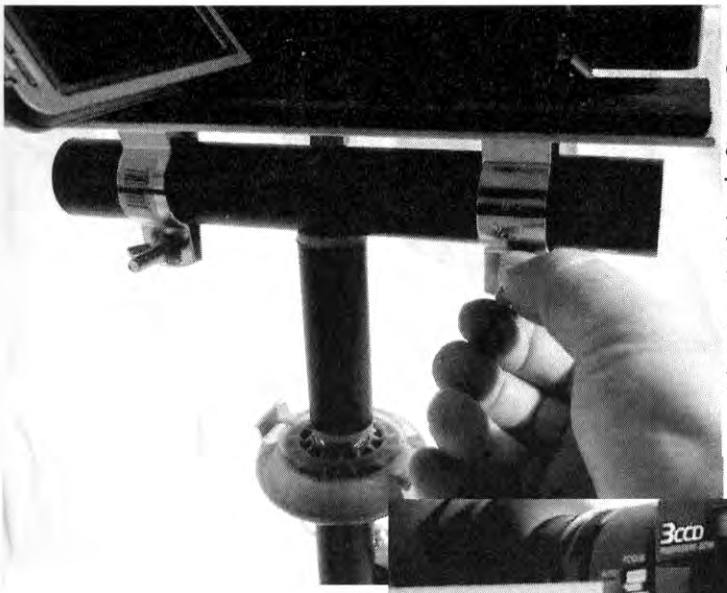
Take your handy handle cradle, and clamp it to a tripod, table, No Parking sign...whatever is handy.

Slide the handle into the PVC pipe. Stand behind the rig while it's in the handle, make sure it matches the same angle as if your were holding it. Take a look at the photos under **It's balanced. Now what.** and match this angle.

Set your level on the base as close to the center support as possible.

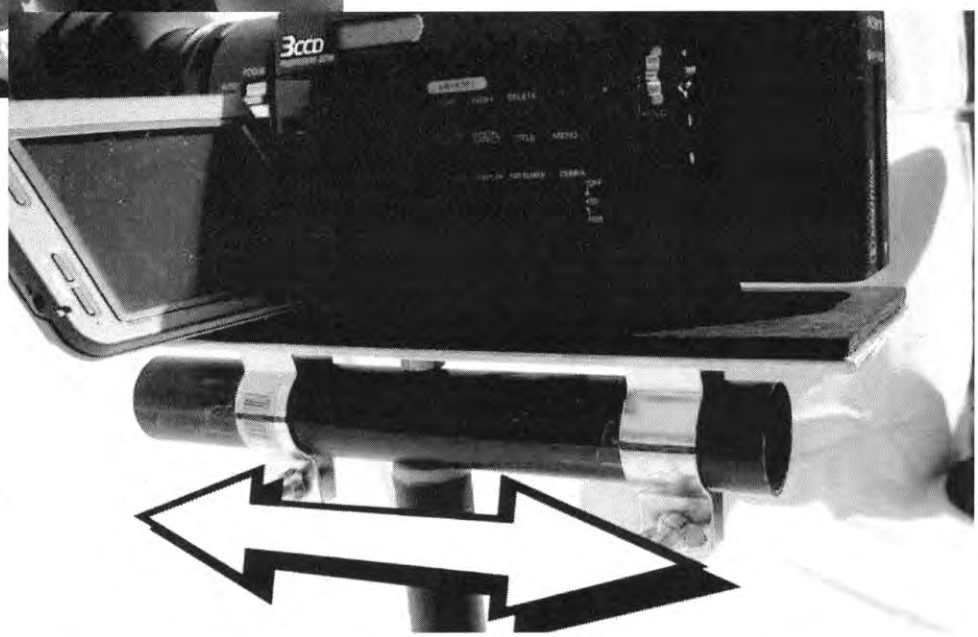
So, how's it look? Pretty out of whack, right. OK, let's get the left/right axis perfect. Shift your camera right or left until your bubble level reads dead center. You'll be moving the camera in TINY, TINY, increments. This rig is beautifully sensitive. Once you've got it, tighten the camera bolt down a bit--not too tight, you'll throw the balance off.



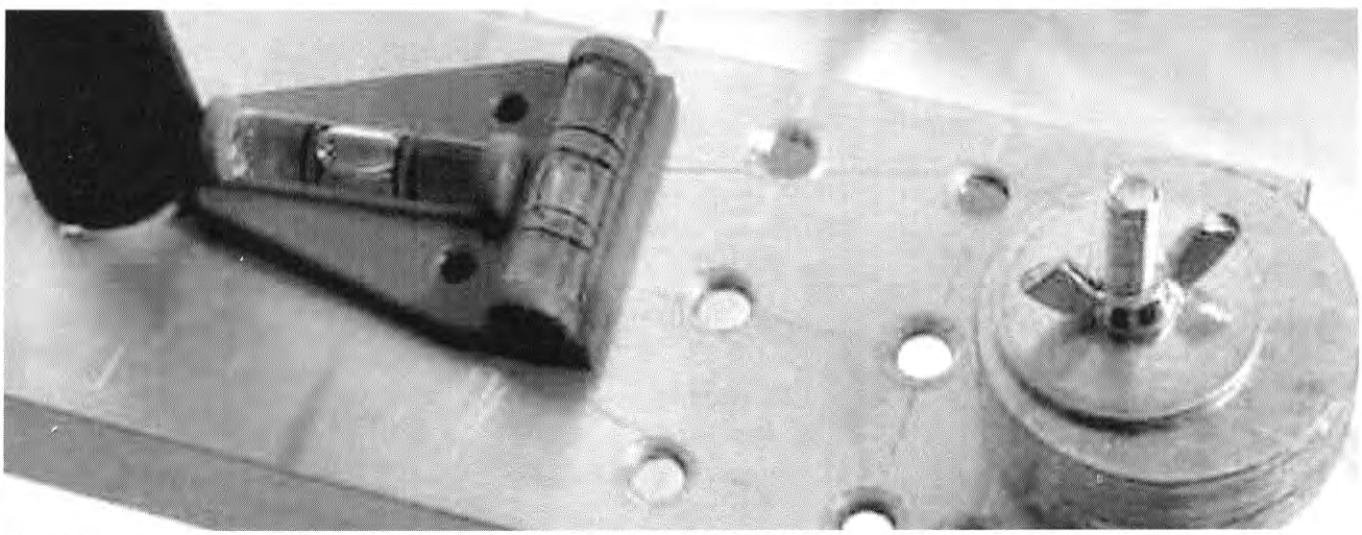


Loosen the wing nuts on the camera plate. Not too much! We want it to be just loose enough to be able to slide the camera plate forward or backward with a bit of pressure without the whole thing falling to one side or the other.

Make sure you keep the plate itself level.



Push the plate forward or backward until your level reads level (duh!).



A thing of beauty! Tighten down wing nuts and make sure the camera plate is still level--aren't you glad you took the time to draw that line?

Other little tricks: You can shift the weights around as well. The more holes you have, the greater control (but don't get carried away). Also, most of the time it's not necessary to move the washers to a different hole. The inner diameter of these heavy washers is so big, that you can shift the stack around the bolt without moving things to a different hole on the base.

If you're using a separate L.C.D. monitor, use one of the weight holes on the front of the base to attach it. The better monitors come with a mount for this purpose. This is where the placement of the bottom weights--and the ability to move them around--is crucial.

Once you have the thing balanced in the handle cradle, take it out and see if it stays balanced while holding it. You might have to make some minor adjustments.

If you're not using the handle cradle: You can still balance the unit. In fact, the commercial versions don't even come with one. Simply set the stabilizer on a flat surface (and I do mean FLAT!), and lift it slightly off the ground. Observe which way the base goes on your left/right axis and adjust accordingly. Then do the front back axis. You'll probably be lifting-adjusting-lifting-adjusting until you're ready to scream. Be patient. You'll get it.

It's balanced. Now what?

As I said in the introduction to this chapter: **stabilizers take practice!** I'm amazed at the amount of filmmakers that run off to the rental house, pay $35-200 bucks a day, and think a Steadicam™ or Glidecam™ is going to do all the work for them. Let me clear up this misconception right now about these devices: you can move around like a mad man and the camera will stay rock solid. **NOT SO!** The idea is to not add any **extra** movement to the device.

Another mistake I see being made quite a bit is **single handed operation.** A stabilizer is a **two handed job!** One hand supports the unit by the handle, the other stays on the center column, either above the gimbal unit or below. Below is usually the preferred method because it makes tilting shots a little easier, (or if you want to start the shot upside down). But I've used both, above and below, from time to time. There is no hard and fast rule here. Just use **two hands!**



Your dominate hand holds the rig by the handle. If you're right handed, you'll see that the handle unit angles off toward the right from the center column. If you're using your left hand, obviously it will angle off to the left. **This is the same angle you must use in the handle cradle while balancing the unit.**





Your other hand guides and steadies the unit by lightly holding the center column above or below the gimbal unit. Use this hand for panning and tilting--getting the lens where you want it.



Walking and chewing gum at the same time

A friend and Mentor of mine, Kris Malkewicz (who has written a number of books on cinematography, now classics that you probably already have), is an amazing camera operator. Kris is a human Steadicam. His recommendation for becoming a great operator is to learn Tai Chi. And you know what? It's incredible. Tai Chi and this stabilizer make a killer combination. The Tai Chi movements are a perfect way to keep from adding any extra movement to the Stabilizer. It keeps the body weight centered, lessens fatigue, and trains you to keep your movements controlled and even. Go out today and buy a Tai Chi video and learn atleast some basics, then apply that to your camera work. **HIGHLY RECOMMENDED!**

But until you get that video, do this: go right now to your sink and fill a glass with water right to the brim. Now, try to walk briskly without spilling a drop. This is basically how you want to walk with the Stabilizer. Knees bent, body centered over your feet, walking heel-toe-heel-toe.

Work with this A LOT. You might be able to get perfect shots for the first 3 minutes, then fatigue will set in. You have to work on your endurance as well as your camera work. Practice in 5 minute increments every day. And you might try switching hands. Practice letting that non-dominate hand do some of the work. Once you're able to do that, no sweat, add another five minutes. When you are on a shoot, practice the shot over and over again long before you have to actually do the shot. Take a long rest (scheduling stabilizer work after lunch is a good idea) then do the shot.

Here are a few photos to clarify what I've been talking about:





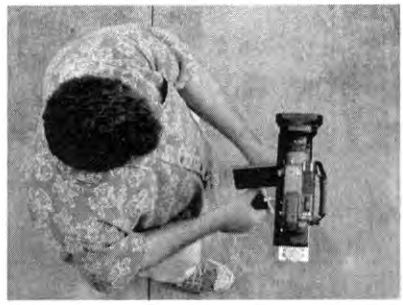


Panning using your body:

Keep your back straight, your knees bent, and your arms in the same position. Keep the lens on the same plane of the arc as you pivot your body.







Panning using the gimbal unit:

Your body stays still, and you simply turn the center column with the control hand.



Tilting down:
Pull back on the center column



Tilting up:
Push forward on the center column





Walking: Keep your knees bent, and use them as shock absorbers. If you want this to look like a dolly, you MUST keep your movement even and the lens at the same height. Heel-toe-heel-toe helps to keep things smooth.

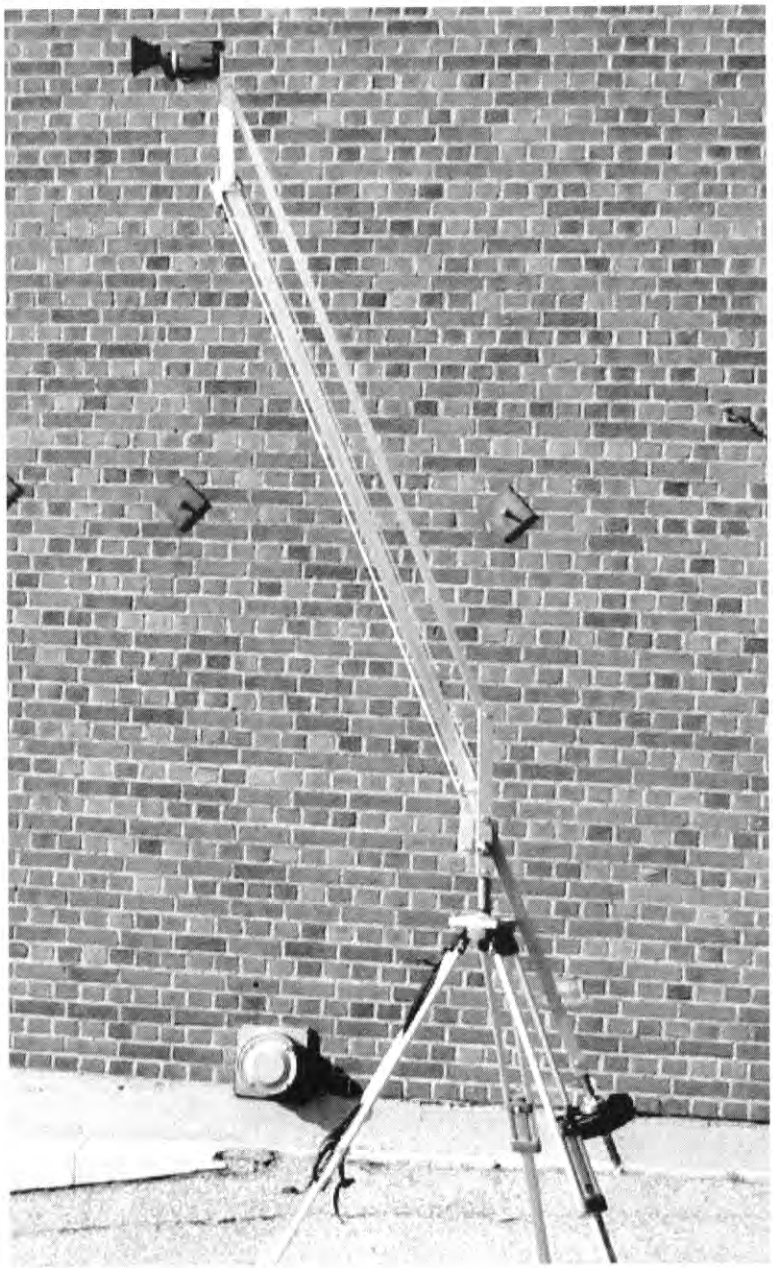
Focal length of the lens also has a lot to do with the steadiness of a shot. The wider the angle, the easier it is to keep things looking smooth. Some of the commercial versions even recommend using a wide angle adapter on your lens. While that will keep the shot looking smooth, I think it's a bit of a cop out. The film should dictate the shot, not the device. I've used my Stabilizer with much tighter focal lengths with good results, but it does take practice. Start wide, and as you get better, try zooming in a bit. All of your small movements will be horribly obvious. (But more obvious to you, than to anyone else!)

Now that you have your very own Stabilizer, please practice. You'll be happy you did.

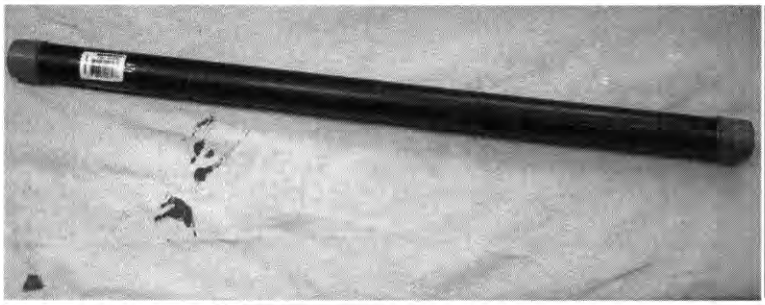
THE BIG COMBO CRANE

A crane is a pretty simple device, and pretty simple to make as well.

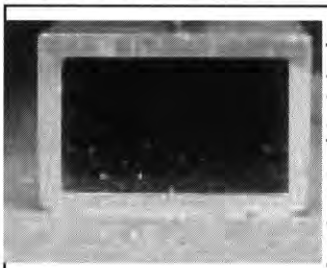
I like having a tripod devoted to the crane. There is no need to spend a fortune on one. I'm using a surveyor's tripod, but you'll need to butch it up. (See plans elsewhere in this book). Surveyor's tripods are pretty cheap--around $80--and work well for these lighter rigs. Just make sure the legs are held down by a spreader and sand bags and you're good to go.



MATERIALS LIST FOR THE BIG COMBO CRANE



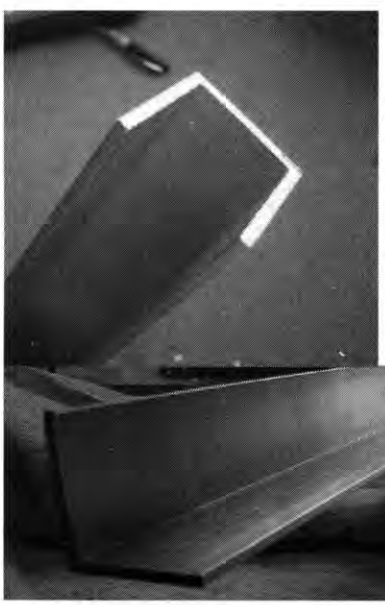
1" diameter by 24" long plumbing pipe with threaded ends.



A length of rectangle aluminum tube. This is the bottom part of the boom and supports the full weight. This one is an 1/8 thick and 1" x 1 1/2" x 9'. 9' or 10' long is plenty. Don't go much smaller than these width measurements unless you're making a very short one. Otherwise it will bounce. **An Important Note:** the bolt lengths in these plans are based on the width of my aluminum of 1 inch. If your aluminum is 1.5" for example, plan accordingly.



A length of square aluminum tube. This is the top part of the boom and supports no weight. This one keeps your lens on the same plane as you boom up or down. This one is 1" x 1" square aluminum tube and is only 1/16" thick. Make it easy on yourself and make sure the width (1") on this arm is the same as the width on the bottom (1") arm. You can do it with different widths, it just takes a little futzing to get them exactly even on assembly.



Channel aluminum. about 30" long and 1/16" to 1/8" thick or better and a 1" wide channel should do nicely. If you can't find channel aluminum, L-shaped aluminum will work fine--heck, maybe even better. Take a look at the Big Carnival Crane plans for using 'L' shape for your camera bracket.



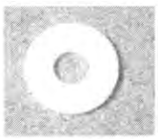
5/16 " bolts in these lengths (or longer)
We'll be chopping them off if they're too Long, so don't worry about exact lengths on any of the bolts. The length will also depend on the thickness of your aluminum bar.

(2) 2 1/4" (1) 2" (1) 1 1/2" (1) 3 1/2"

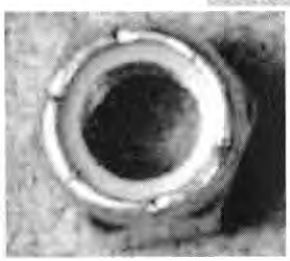


1/2 " bolts in these lengths (or longer)

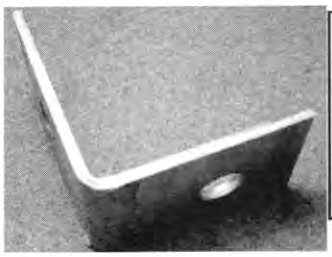
(1) 1/2" (1) 4"



(12) Nylon washers. Get two to fit the 1/2" bolt. 5/16" on the rest.

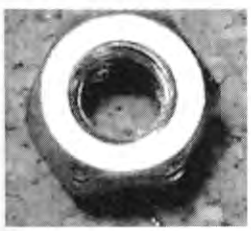


(5) 5/16" lock nuts.
(2) 1/2" lock nuts.

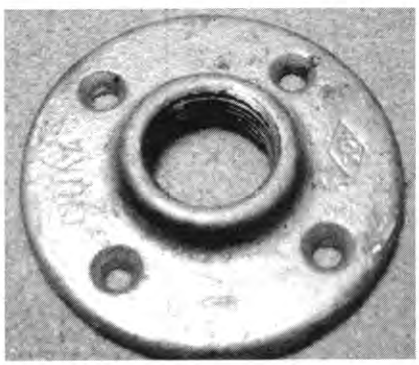


(1) 3" simpsons strong tie L-bracket

Materials for the Crane Base



(4) 1/4" nuts



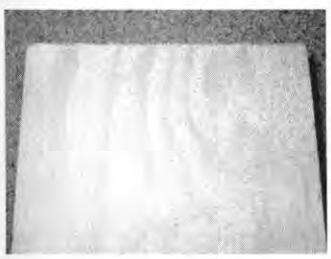
(1) floor flange for 1" pipe.



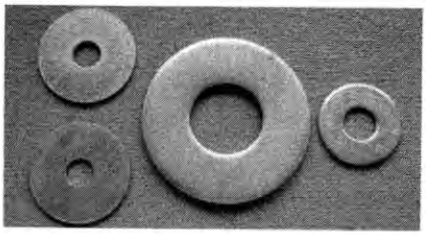
(4) 1/4" x 1" long bolts. These attach the flange to the plywood.



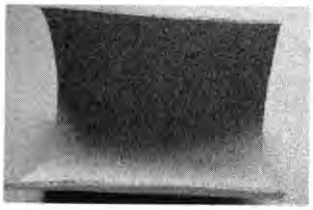
Wing nut for holding your mounting plate to the tripod. 5/16" to 1/2", depending on how big a bolt you get. 1/2" is best. 5/16" is absolute minimum.



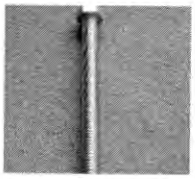
3/4" thick plywood. A 4" square.



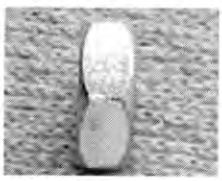
An assortment of washers: (2) fender washers. A large mean lookin' washer. And a regular washer just small enough to fit inside the pipe hole on the floor flange. ☐



A small square of thin cork. This will be glued to the 4" x4" plywood above, so get some at least that large. ☐

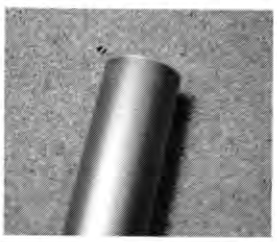


Bolt 5/16" to 1/2" x 3". 1/2" is best. This mounts the crane plate to the tripod. ☐



5/16" Jam nut Jam nuts are narrower than regular nuts. ☐

Materials for the weight end



1" O.D. aluminum tube. about a foot will do. If you've made the stabilizer, you've got this already. ☐



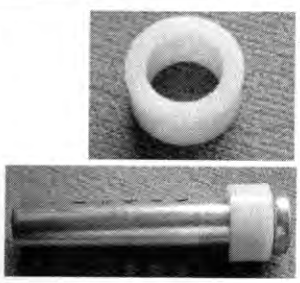
An assortment of weights. Around 20 pounds total. Better to get a bunch of lighter ones than one heavy one. You might also want to grab about 10 monster washers for fine tuning. Make sure the hole is large enough for the above tube to slip through. ☐



(2) Conduit hangers. This will hold your weights steady. Get hangers for 3/4" -1" pipe. (These are smaller than the stabilizer ones). ☐



Cotter pin. 2-3" long and around 5/16" diameter. This goes through the above aluminum tube. ☐

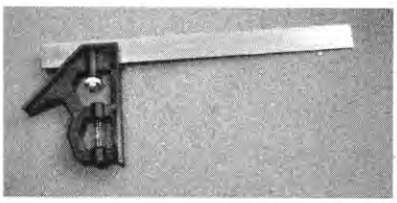


A nylon spacer. about 3/4-1". This goes at the end of your cotter pin. ☐

TOOLS LIST FOR THE BIG COMBO CRANE



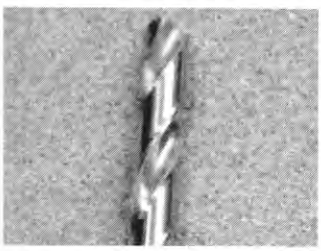
A good assortment of clamps--at least 4 of the type here.



Combination square.



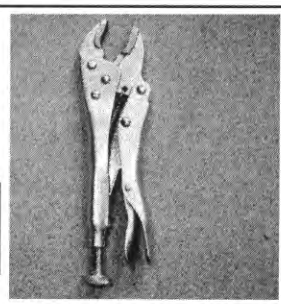
A drill. Get one with "variable speed" ability.



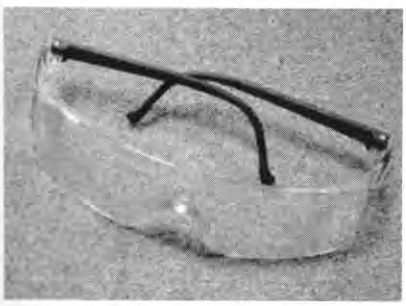
1/2" bit

1/8" bit

5/16" bit



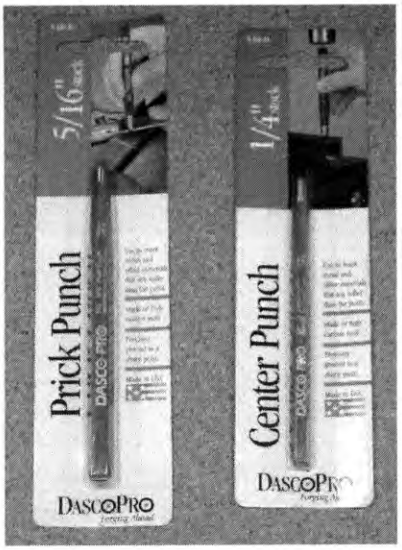
Locking pliers.



Safety Glasses.
Don't be a chump. Use 'em



Cutting Oil. You use this when drilling into metal. You might want to pick up a little oil can to put it in.



Center Punch and Prick Punch.

A **Center Punch** is used to put a small dimple in metal where you're going to drill a hole. You have to have this or your drill bit will "walk" across the metal, and that's not good at all.

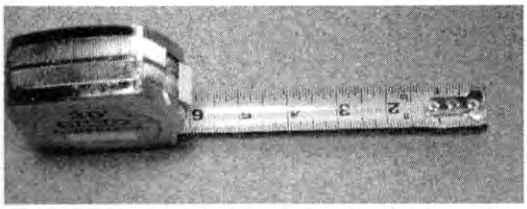
The **Prick Punch** scratches into the metal for marking (a pencil comes off too easily).



If you don't have a drill press, I really encourage you to get one of these. It's a handy drill guide, and will keep your holes straight and true--very important in this type of work. It also has a V in its base to hold a round piece of pipe for perfect center drilling (something we do alot around here.) It runs about $35 bucks. A good investment if you build more than one project in this book.



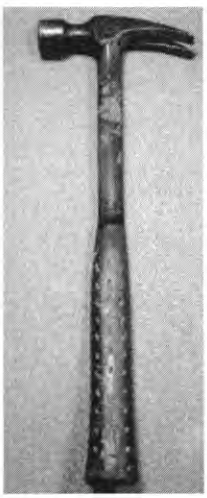
Vise. gotta have it. I found this one at OSH for $9.95, so the investment is minimal. Mount it on your bench or a heavy piece of plywood.



Tape measure



Hacksaw. Get extra blades that have 4-16 teeth. (A soft metal like aluminum doesn't like any more than 16 teeth.)



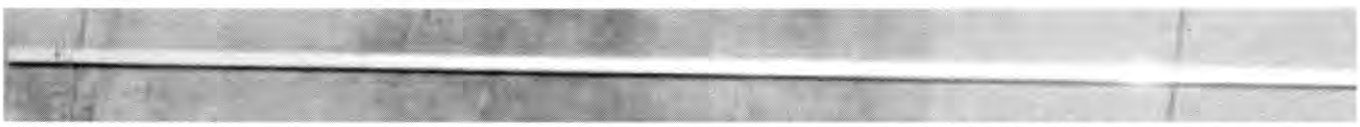
A hammer for thwacking

READ THIS. IT'S IMPORTANT

As with the Stabilizer, we're going to be drilling into metal. Please follow these guidelines:

1. Always wear safety glasses. It only take one metal chip to end your career.
2. Always clamp your work.
3. Make sure your drill bit stays "wet" with drill oil
4. **What to do if your drill jams in the metal:** The minute you feel the bit jam (you'll feel the drill turning instead of the bit) **IMMEDIATELY** release the trigger on your drill. Put the bit in reverse and back it out. Put the bit in forward motion again, position the bit slightly **above** the hole you started. Start the bit spinning at a good clip **before** lowering it back into the hole, if you start the bit in the hole it will just jam again. Lower it back and finish the hole. You can see why it's better to have some sort of drill jig or drill press while doing this kind of work.

BEWARE: If your bit jams and your work is not clamped down, you **WILL** get hurt by a big hunk of spinning metal. CLAMP YOUR WORK!!





The Bend Test

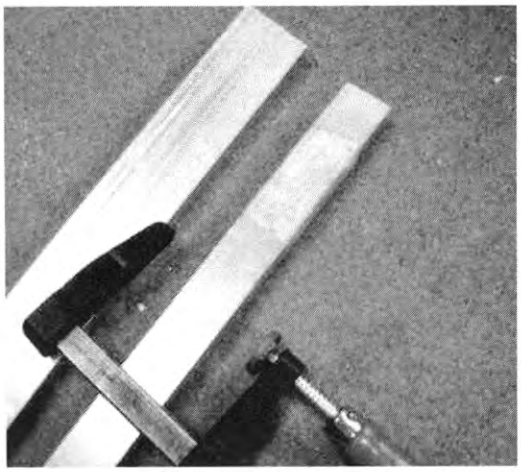
To find out if your main boom arm is hefty enough, do this test: Get a weight equal or heavier than your camera and clamp it to one end of your aluminum. Put an equal weight on the other and balance it on your tripod. If it bends, even slightly, get a heftier piece. I'm using 10 pounds for this test for a margin of safety. Even better if you have a friend who can push down on one end as you push down on the other.

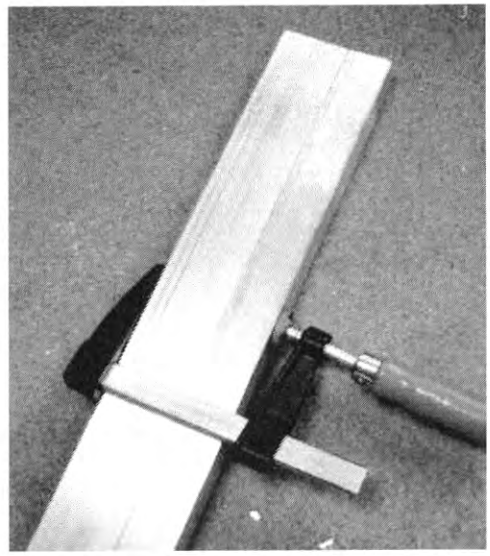
I found this 9' long rectangle aluminum tube at the metal supply shop. You can go as long as you need, but things can get a little scary at about 12'. 9 or 10 feet is quite respectable. This is the boom arm, and will carry all the weight, so get something sturdy. This is 1" x 1 1/2" by 1/4" Thick. You also need to think about how you'll get this long rig to your shoot.



Let's build it

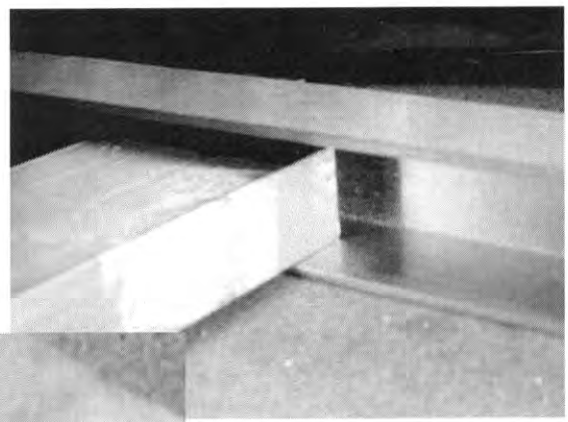
Take your bottom boom arm and the top control arm and clamp them side by side.

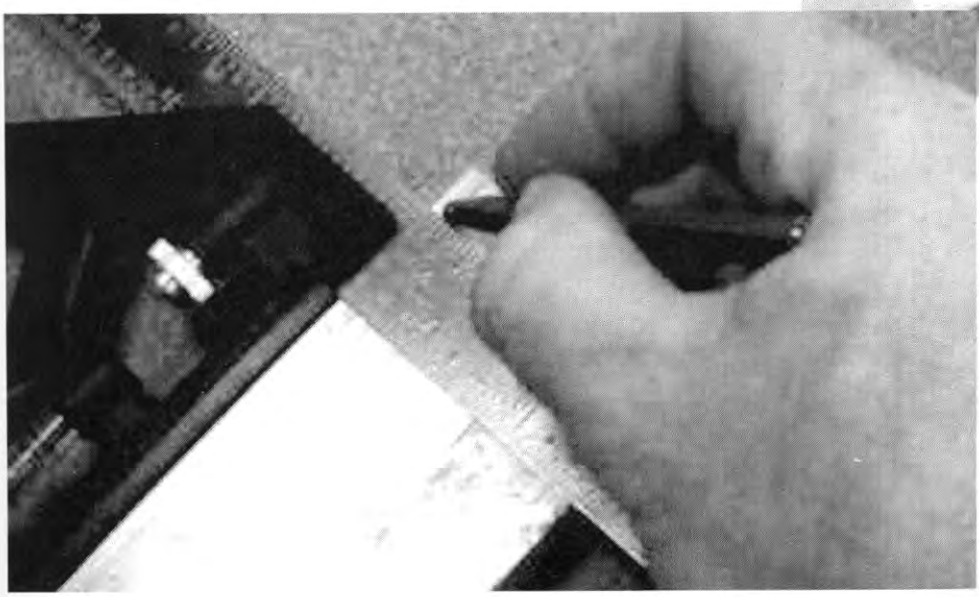




We need to mark where to drill our holes for the center support that holds the crane on the tripod. (which actually isn't in the center at all) and for the channel aluminum that will hold the camera (see page 125).

2. On my 2 boom pieces, I'm going to drill a hole as close to the edge as I can, without compromising the strength of the aluminum.

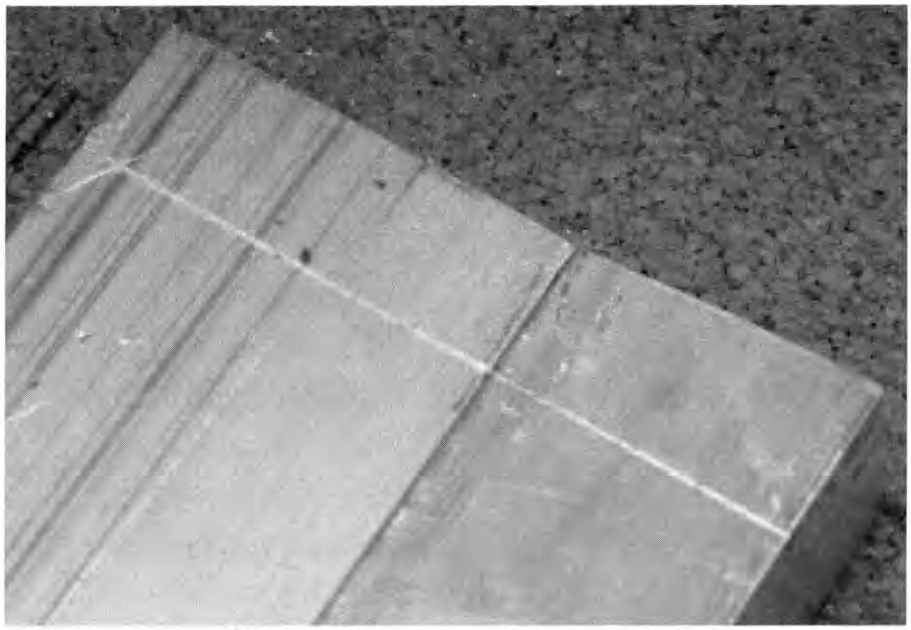




So with that in mind, use your square to draw a line straight across the 2 pieces about 1/8" from the end.

There.

Now we're going to do the same thing for the holes for the center support.



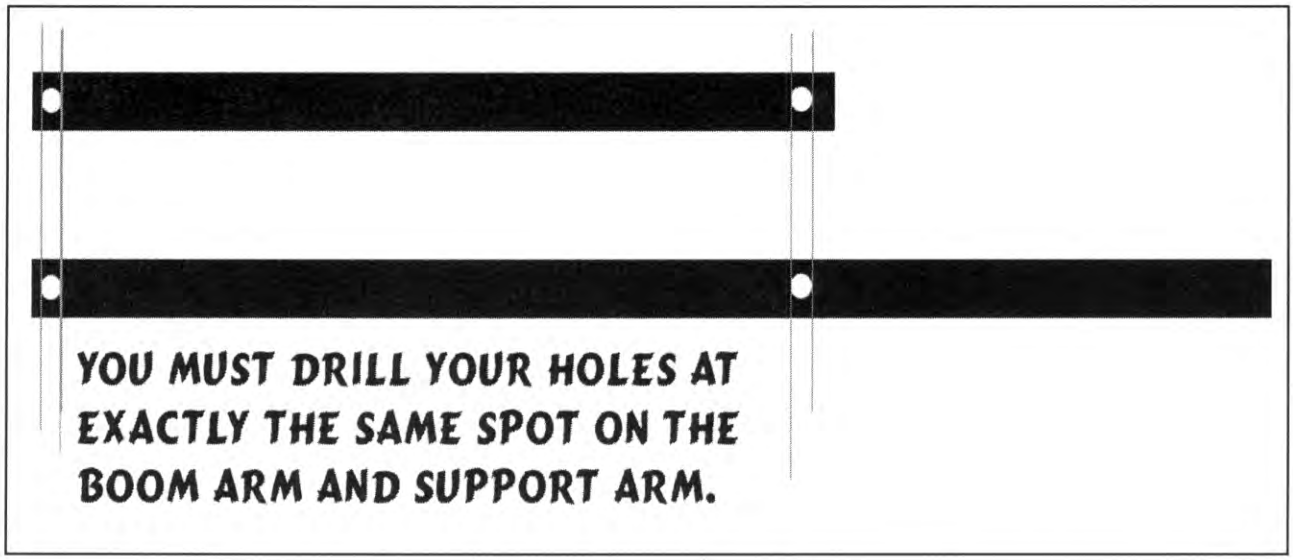
Where do I put the holes for the center support coming up from the tripod?

Let's talk a little about where to put the holes for the center column. As a rule, you want to put the center support at about 1/3 the length of your boom. On our 9' boom, that would be at 3 feet from the end. This is a good general purpose point, but I want just a little more reach for my camera, so I'm going to back up to 2' 6". If you have a camera more the 7 pounds, I wouldn't recommend backing up more than this. Also, the farther you are from dead center, the more weight you're going to have to haul around.

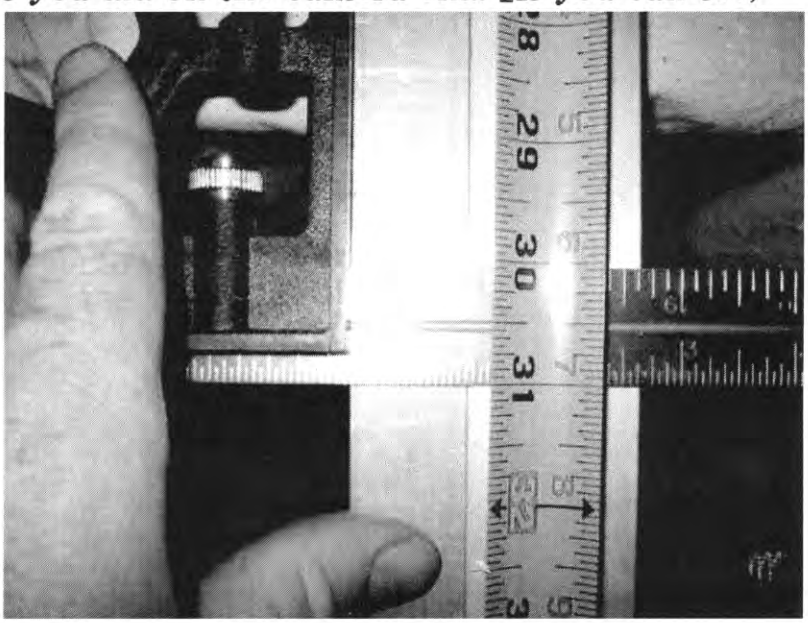
All of this is relative. If you have a 2 pound camera, you can get away with a lot more reach on the boom end than if you have a 10 pound camera. If you're using a 12' boom arm, staying at 1/3 mark is a very good idea regardless. Or if you have a big camera and don't want to carry a bunch of weight around, even a little more toward dead center would be a great idea.



In other words, give this some thought, and experiment a bit by clamping some weights at one end the same weight as the largest camera you'll use, and some counter weight at the other and lay it across some kind of support like a saw horse. Try different points along the boom to see what you can easily control.



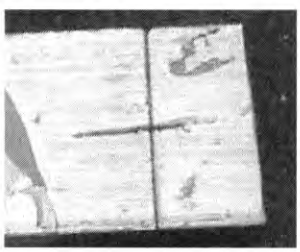
3. So with all of that in mind, mark the booms for the center column. Measure from the opposite (what will be the weight) end and draw a line straight across both pieces as you did on the camera end. As you can see, I'm making my mark at 2' 6" from the back of the crane instead of the 1/3 mark of 3 feet.



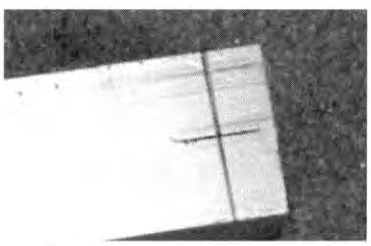
4.

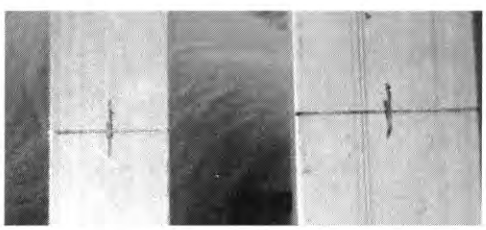
Now you can unclamp the 2 arms from one another.

Measure half way across each mark and make another line at the center of the arms on both the camera end and the mid section.



camera end cross marks.



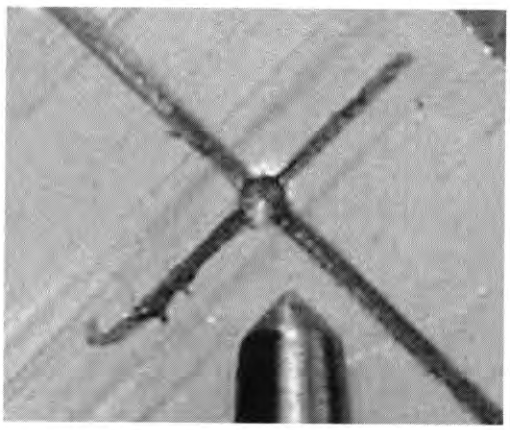


center support cross marks.

5.

Use your center punch to make a dimple on each of the 4 crosses.

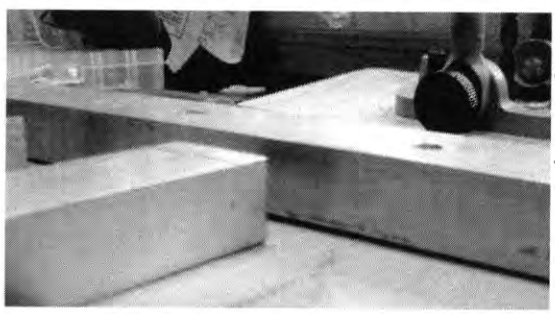
These will keep your drill bit from walking.





6.

Drill the Holes.
I'm using my drill jig, but I've modified it a bit by attaching it to a piece of plywood with a big hole drilled in the center. Attaching it to the plywood gives me more surface for clamping.

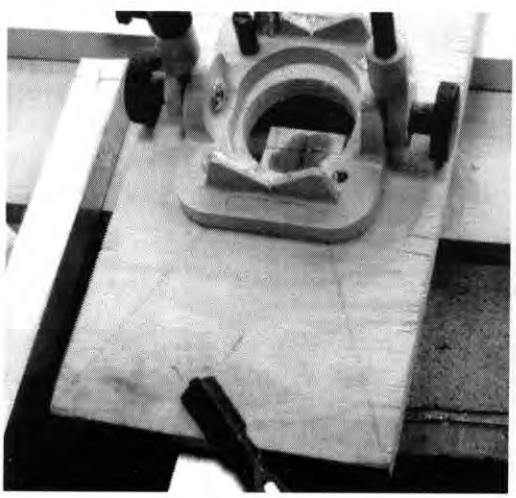


First, I'm going to use a scrap piece of aluminum to the same thickness as my boom arm to support my drilling jig.

Then I'll clamp the jig, the metal, everything to my bench. You DO NOT want anything moving when you start to drill.

For the holes on the camera end of both arms, I'm going to use a 5/16" bit. Add a little lubricant to the dimples and drill your holes.

WARNING: If you're going to put the tilt plate on, use a 3/8" bit!





Of course you want to get a bit that is rated for metal, and the more you spend on the bit, the easier and longer lasting it will be.
Make sure you get the point of the bit in the dimple you made.



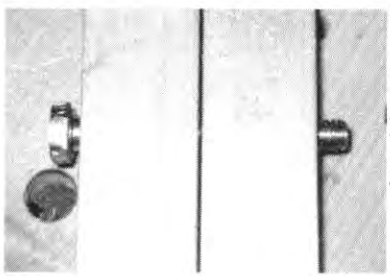
And here are our 2 holes for the camera end.

Next we'll do the holes for the center column.



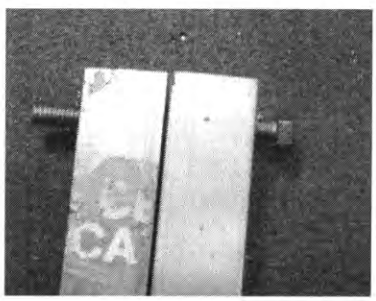
Do these just like the others: clamp your work, use lubricant, and get the point of the bit in the dimple.

For the big boom arm, use a big 1/2" drill bit. For the smaller top support arm, a 5/16" bit will do.



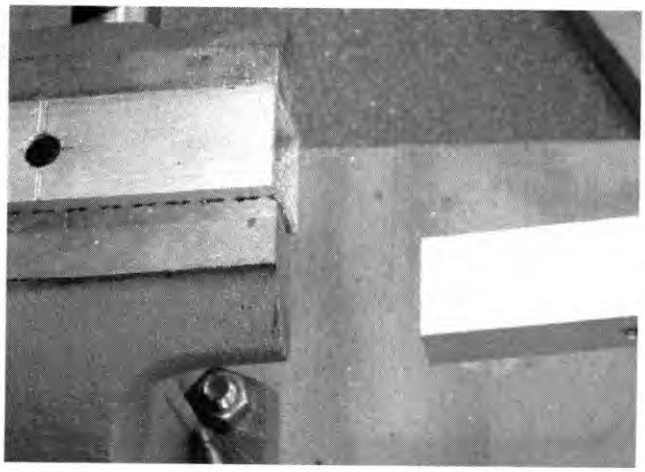
Make sure your holes are even with one another by running a bolt through both sets of holes.

If they are off, trim off an 1" on the camera end of the arms and re-drill those holes.



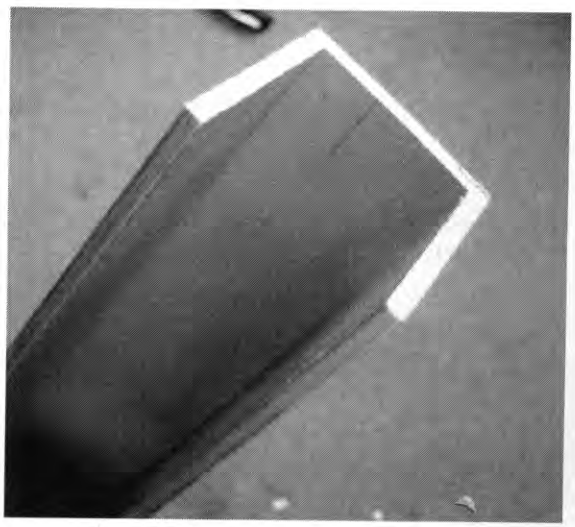
7.

Cut off the excess from the top arm a few inches behind the hole for the center column. You don't need this piece of aluminum to run the entire length of the bottom main arm. Take a look at the graphic on page 97.

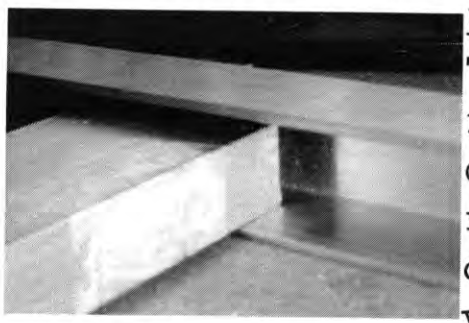


8.

Now let's make the part that will keep our camera on the same plane as we boom up and down.



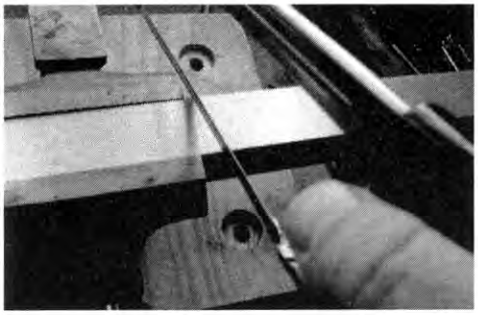
Grab your piece of channel aluminum. The channel has to be big enough to fit around the width of your boom arm with a little breathing room. The measurements for my channel aluminum are 1 1/2" deep and 1 1/2" wide. You really don't want to go smaller than this or bigger than 2" deep.





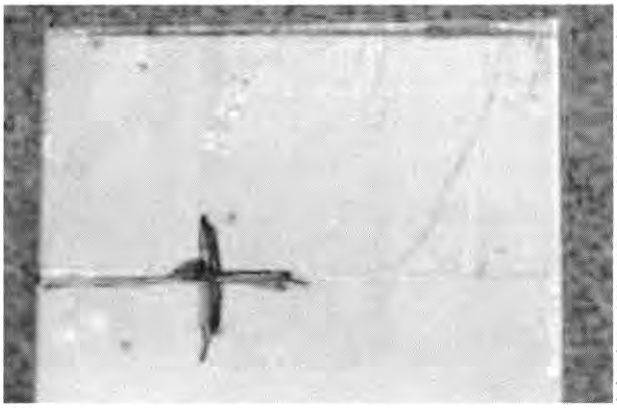
The amount of space that we keep between the top boom arm apart from the bottom boom arm dictates how high you can boom before the 2 arms touch. The wider the placement, the higher you go (not withstanding other factors like tripod height and boom length). Don't space your arms any closer than 8" or so. And don't go too far apart unless you have one massive tripod to hold your camera going into the stratosphere. Keeping the arms at 12" apart is perfect.

So at 12" apart, I'm only going to need about a 13" length of aluminum channel. In other words just add an inch to the spacing you want between the top and bottom arm.



If you're building one just like mine, cut that baby at 13".

9.

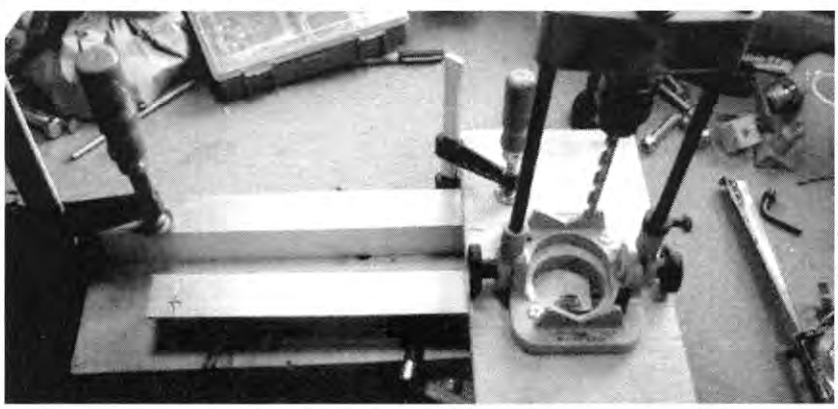


Now we need to drill some more holes to attach the boom arms to the aluminum channel that will hold our camera.

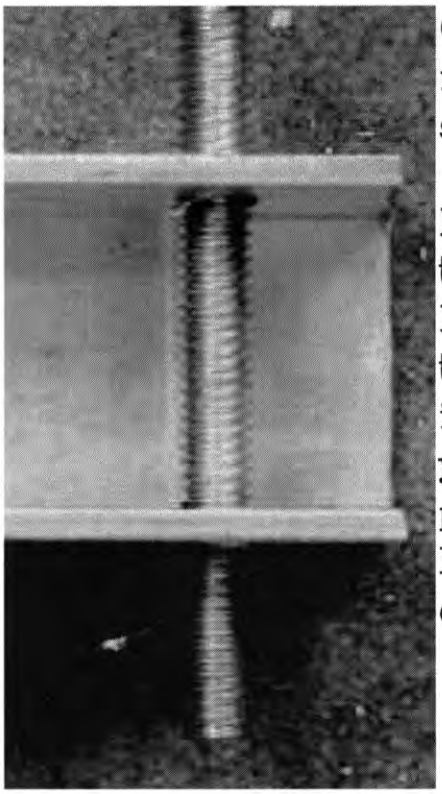
If you'll take a close look at the photo, you'll see that our mark IS NOT dead center this time. The reason for this is to leave the boom arms enough room at the front of the channel to be able to move freely as we boom up and down.

I've put my mark 1/2" in from the OPEN edge of the channel. I've also gone down 1/2" from the end. Do the same on the other end as well MAKING SURE THE MARKS ARE IN PERFECT ALIGNMENT TO ONE ANOTHER.



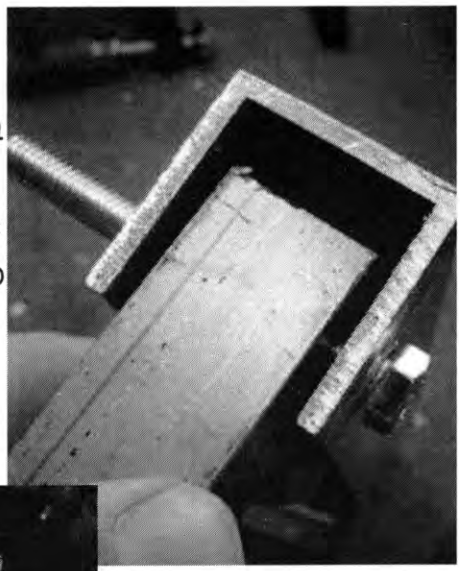


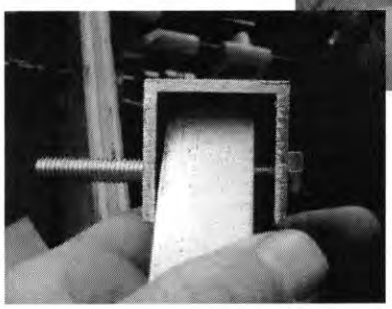
You should be an old hand at drilling in aluminum by now. Remember: Wear safety glasses, set the work on a piece of scrap wood, clamp everything, add a little oil to the dimple, and drill away. For the holes on the channel, I'm going to use a 5/16" bit. As in life, make sure you go straight and true. **ATTENTION: if you're putting the tilt wheel on, use a 3/8" hole in the bottom.** (If you blow this part, 5/16" will still work ok, so don't panic.)



Once your holes are done, run a bolt through them to make sure it's straight. If not, you've got to re-drill some new ones. Sorry. Very Important!

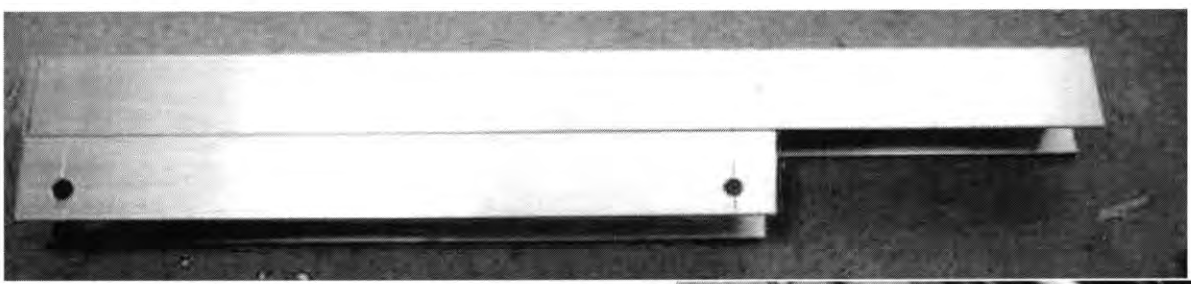
If your holes are straight, take your boom arms and line up the end holes with the holes you just drilled in the channel. Make sure you've got enough room to pivot the arm without hitting the front of the channel.



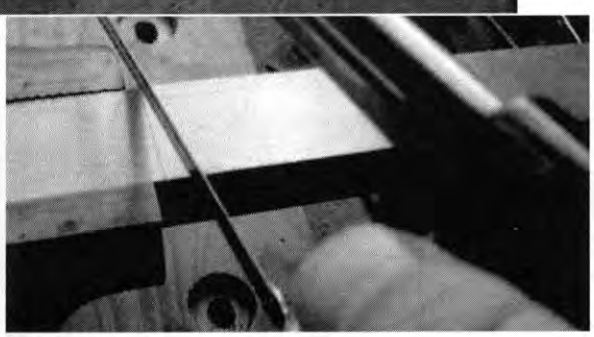


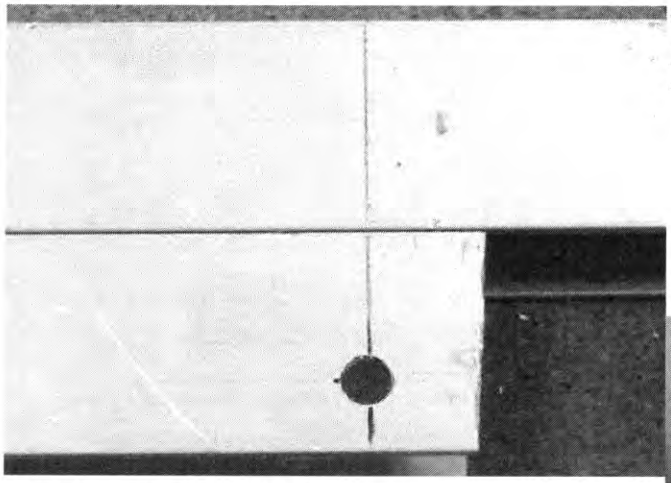
10.

Grab what's left of your aluminum channel (should be about 18" -20") and set it next to the channel aluminum you just drilled.
Like this:



Take your combination square and line up the straight edge with the old line you made on the finished front piece and make a new line across the longer piece of channel. Do this on both holes. This is why it's important to use a prick punch for marking.

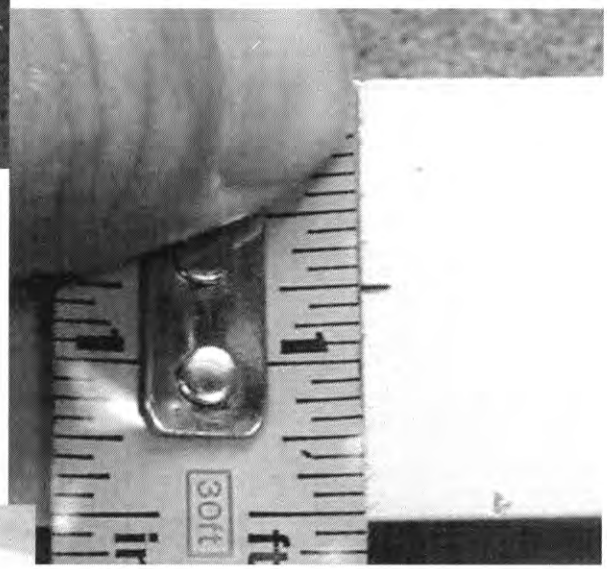


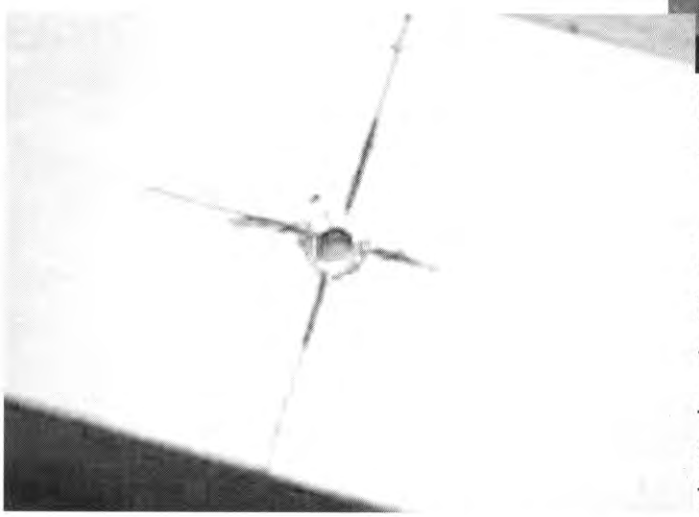


You should have something that looks like this.

Next measure half way across the piece and put your cross mark. Next, hammer your dimple.

Do this on both ends.

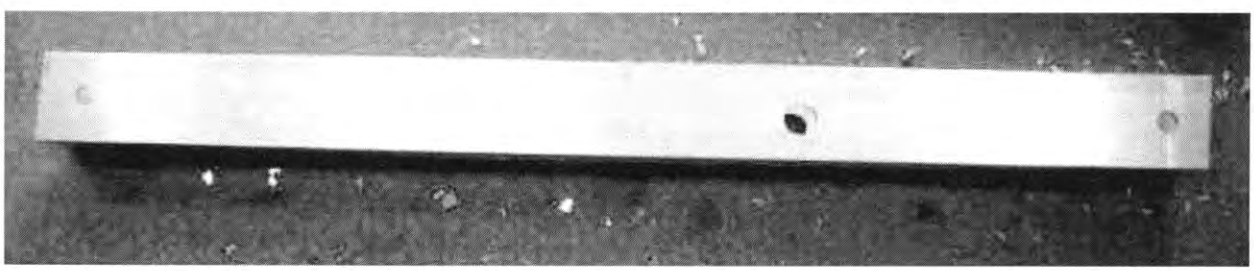




Drill 5/16 hole on the top of the channel, and a 1/2" hole on the bottom.

Do This:

It might be a good idea to drill a small pilot hole like the one on the left, especially for the half inch hole.
As the name suggests, this hole helps guide the larger bit, and makes getting things straight a little easier.

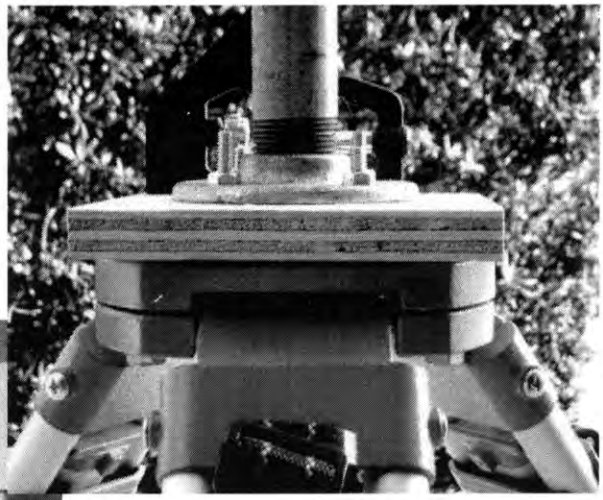


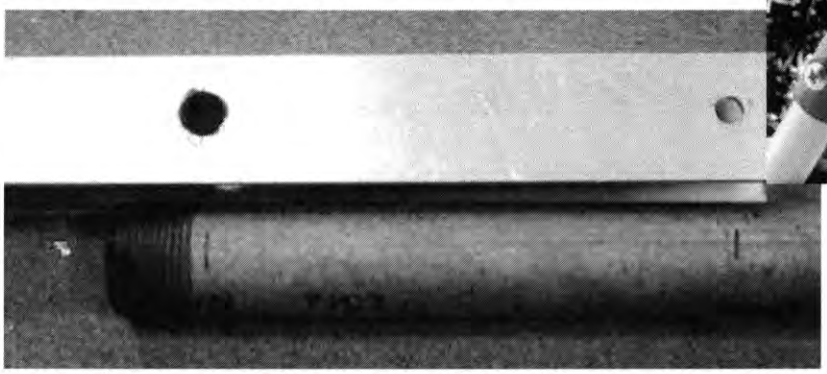
Once you have your perfect 1/2" and 5/16" holes, drill another 5/16" hole at the bottom. It doesn't have to line up with anything, we'll be using this to bolt the channel onto our center shaft.

11.

Now we're going to bolt our channel aluminum onto a 1" steel plumbing pipe.

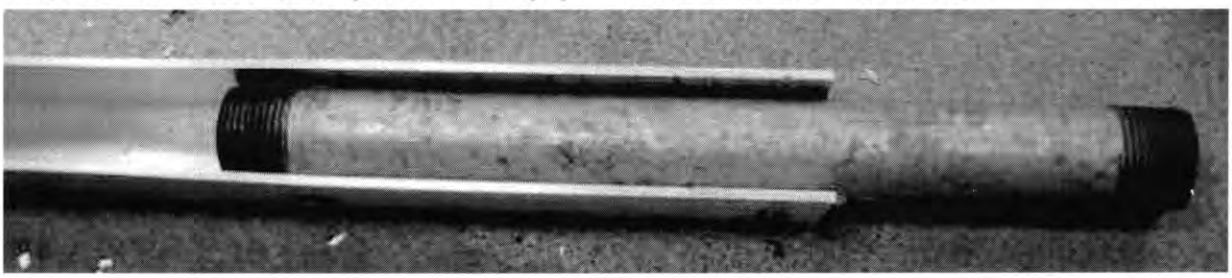
The pipe is used as a connector to the tripod, and to give the center column a little more strength.



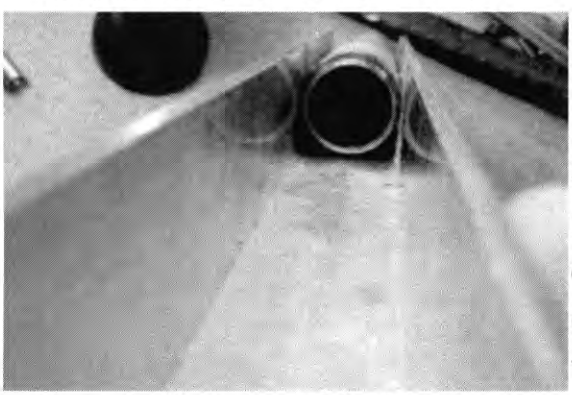


You'll need about 24" of the 1" pipe. Line the pipe up in the channel aluminum at the point just below the threads and the 1/2" hole in the channel.

Take a hammer and pound the pipe down into the channel.

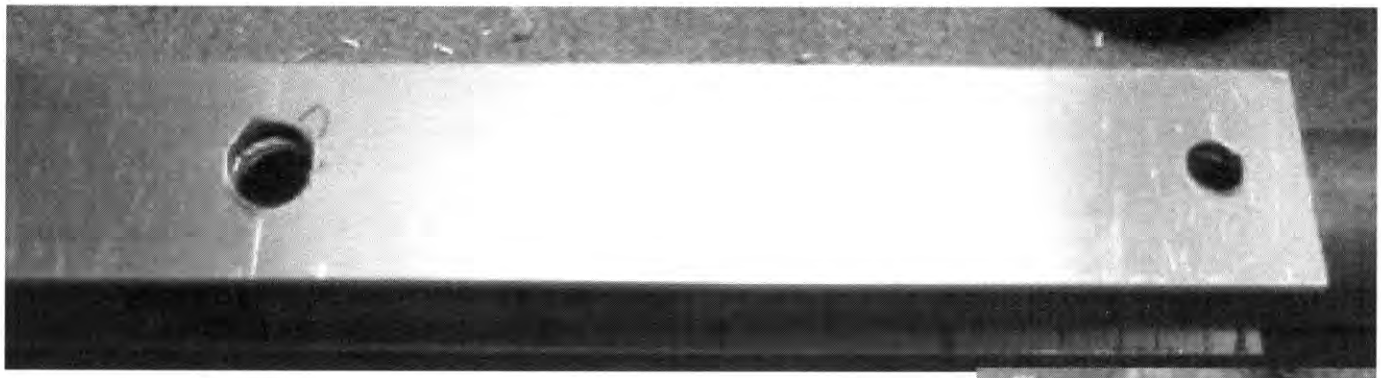


Of course, pounding won't be necessary if you're using a wider channel or L-shaped aluminum for this.



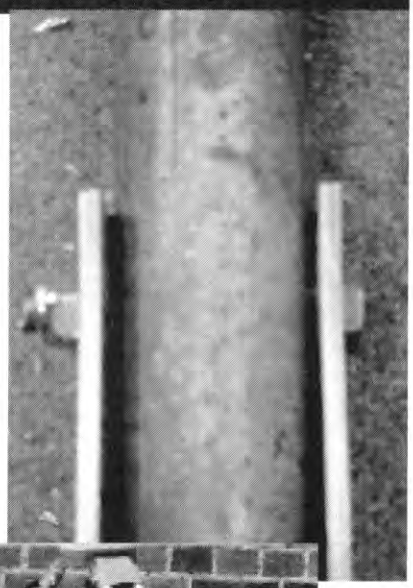
Once you have the pipe pounded all the way in, you'll need to drill holes in it.

Simply use the holes in the aluminum channel as your guide. The only difference here is: drill through one side of the pipe, then flip it over and drill through the other. Obviously, use a 1/2" bit on the 1/2" hole and a 5/16" on the 5/16" hole. This is a harder metal than aluminum, so use a slower speed, plenty of lubricant (add more as you go) and sharp bits.



And there she is.

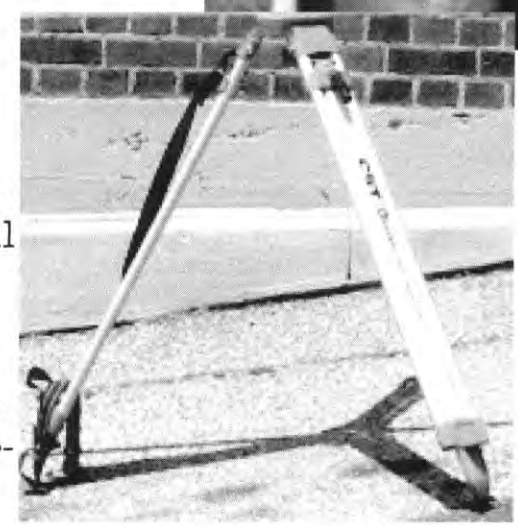
Put a 2" bolt in the bottom hole and tighten it down with a lock nut.



12.

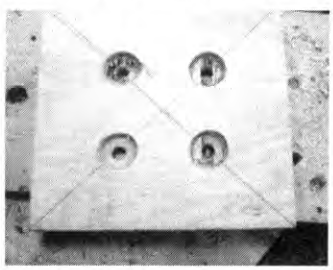
The base.

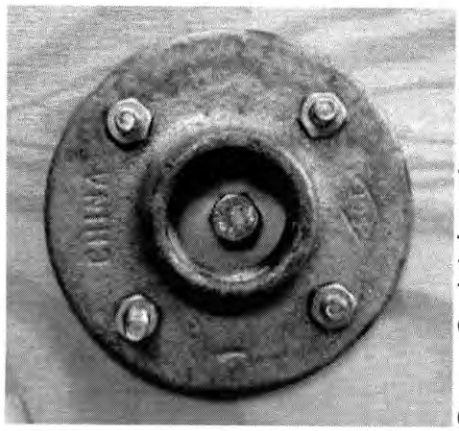
You have to have a good sized tripod, and a good sized head plate on that tripod for a crane. That's why I like the butched up version of the surveyor's tripod as a cheap alternative. But if you've got a better tripod, by all means, use it! Here's how to make a base for tripods of the surveyor variety.



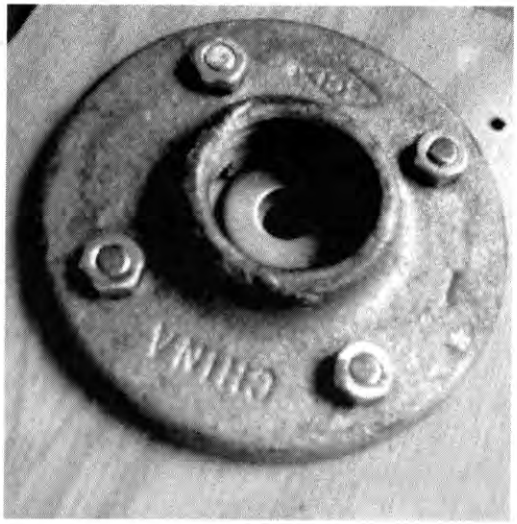
Cut a square block of 3/4" plywood about the size of the tripod base. Draw an "X" from corner to corner of the wood. The center of the X is the center of the board.

Take a 1" pipe flange and line it up dead center on the plywood. Mark on the board where the holes are on the flange. Drill four holes to hold your bolts (don't use screws here!) Counter sink the bottom side bolt holes as shown in the photo on the right (remember the stabilizer camera plate?) You'll need a drill bit larger than the head of your bolt. Drill a 5/16" to 1/2" hole (whatever size bolt you got for this part) in the center for the bolt to hold the unit to the tripod.

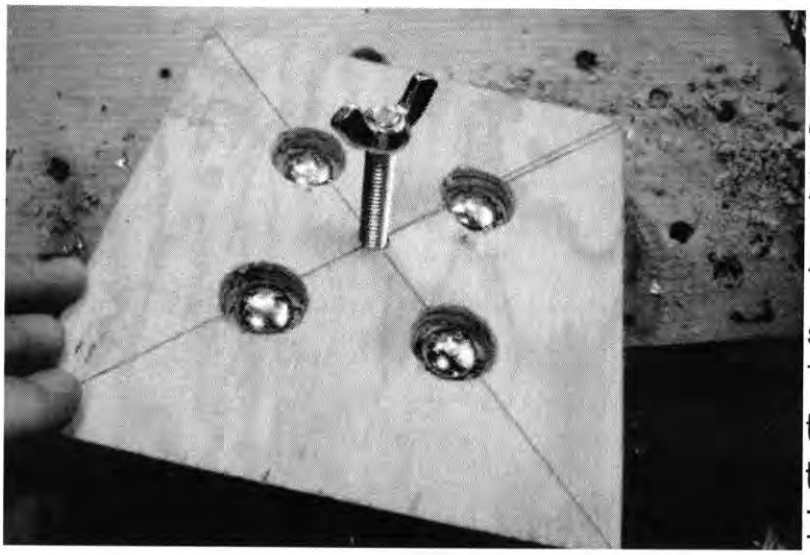




Here's what you should have so far: The pipe flange is bolted to the top. If the bolts extend beyond the nut, take a hack saw and cut them off.



On the bottom, the 4 bolts holding the flange should be countersunk below the surface of the plywood, and a hole in the middle for the bolt to hold the whole thing on the tripod.



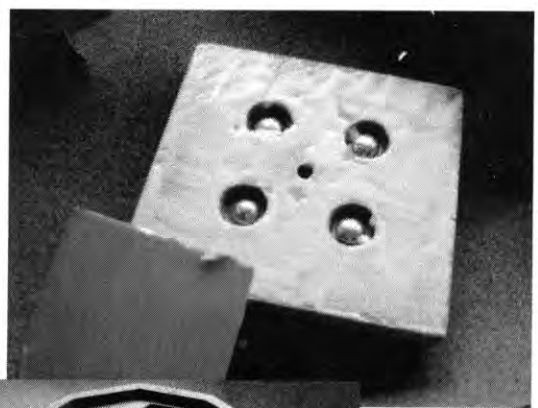
The next step is optional, but a REALLY GOOD IDEA.

You'll need some cork. The thin stuff from a cork roll is perfect. You may have already purchased this for some other mounts in the book. DO NOT USE A MOUSE PAD FOR THIS PART.

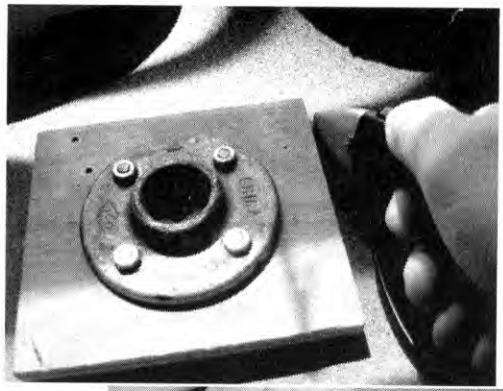
Spread some wood glue evenly over the base. Flip the flange unit over onto a sheet of cork.

Weight it down and let it dry for a few hours.

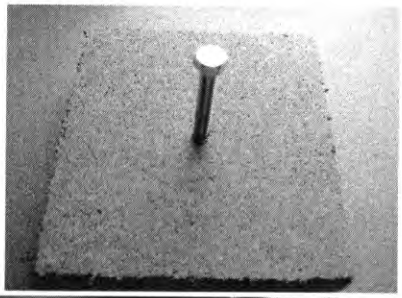




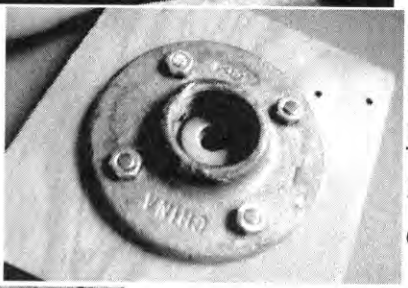




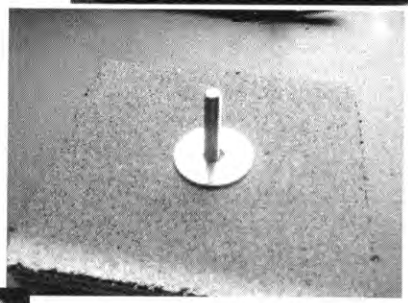
Trim off the excess cork.



Poke a hole in the cork with a bolt.

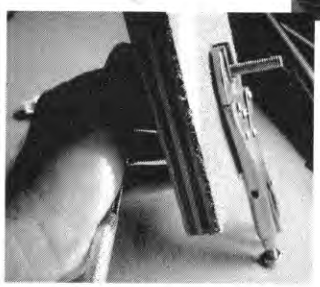


Drop a washer in the flange hole and run a bolt through. Add a fender washer on the cork side.

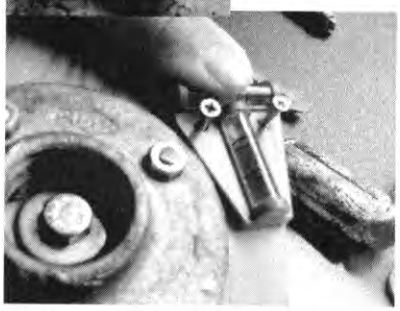




Use a Jam Nut and Lok Tite to attach the bolt to the base.







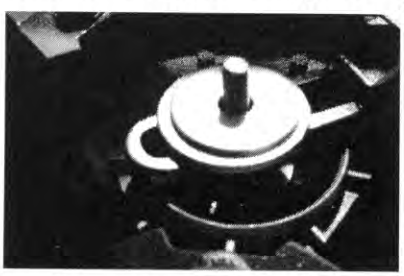
On the top side, I'm going to attach this multi-level. Very handy! Go pick one up!

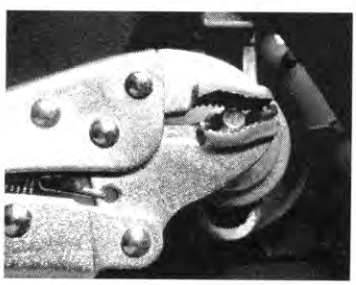


Set up your tripod and look underneath. Do you see that thing that looks like a giant paper clip?

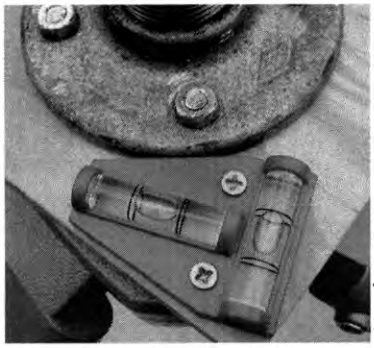
Run the platform bolt through there, add a washer or two, and tighten the whole thing down with a wing nut.

Eventhough you can tighten the wing nut with your fingers, use pliers to get it super tight.





Level out your tripod and take the crane's support piece--the plumbing pipe that's in the channel. Screw the pipe into the flange that you just attached to your tripod all the way snug, then unscrew it one turn. It's these threads that the crane will pivot on.



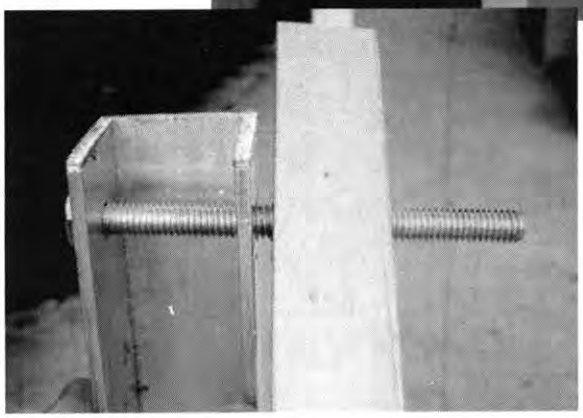
Make sure the tripod is perfectly level and stays that way. Now we'll loosely put the crane together. The center support column should be screwed in to the floor flange at this point



Put a 1/2" bolt through the bottom arm support hole and slide the large boom arm on to it. Don't worry about tightening any thing down at this point. We're going to be taking it apart soon.

Take your channel and attach the large boom arm with a bolt to the bottom hole in the channel.

Do the same with the smaller upper boom arm.



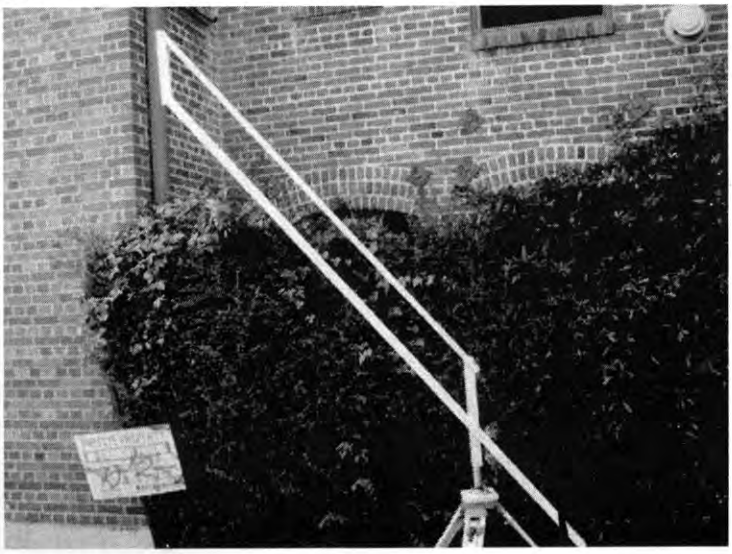
This is the smaller top arm on the center support



Does it look like this?

Try boom up and down and panning right and left.

The unit turns on the threads of the pipe quite nicely, doesn't it?





Take a look at the front bit.

Does it stay on the same axis as you crane up and down?

If so, good job. If not, your holes are off. Back to the drill press for you.



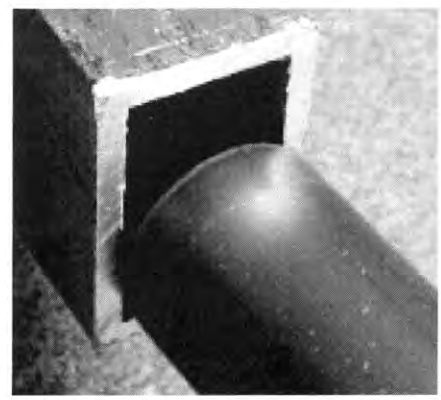
13.

OK. Back to the workshop, or, you know, my kitchen.



Now we need a way to put weights on the opposite end. The easy way of course is to drill a big hole in our large boom arm, put a huge bolt there and throw the weights on (see the Big Carnival Crane for an option to attaching weights--this is better though).

BUT...I still have some of this 1" tube left over from the stabilizer project, and the weights I found at the sport shop have a hole that is just about perfect for the tube...



The problem is the tube won't fit inside the aluminum arm.

Good thing I have a vise.

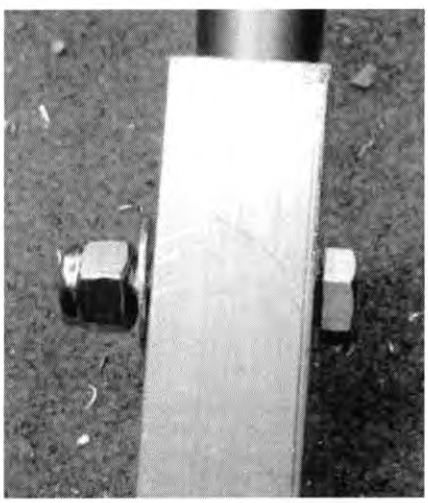
Stick the end of the tube in the vise and start squeezing. As long as it doesn't crimp, it'll be plenty strong enough. Squeeze it until it fits inside the boom.





That's the ticket!

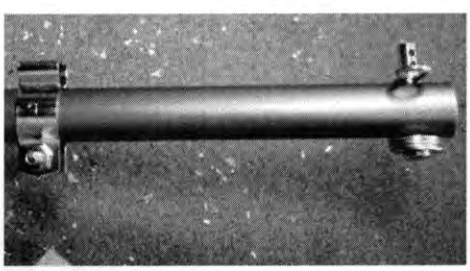
Let's drill a hole through the whole shebang and add a bolt with a lock nut. I used a 5/16" x 2" bolt here. That puppy's not going anywhere.





Now, in the end of the aluminum tube, drill a hole big enough for this pin.

Once again, I'm using a 5/16" pin.





Use our friend from the Stabilizer: the electrical conduit hanger, to keep the weights in place. Just slide it against them and tighten the nut. If you have two hangers, that's the best.

14.



The camera bracket.

We're going to use a 3" L-bracket to mount the camera on our crane. (Take a look in the Make It Groovy section to give this bracket a little flare).

Arrange the 'L' bracket so that it just peeks over the top of the channel that goes on the front of the crane.



Mark the hole in the front of the aluminum channel and drill a 1/2" hole.

Bolt the bracket on using a 1/2" bolt about 1/2" - 3/4" long. Use a washer and lock nut on this one too.



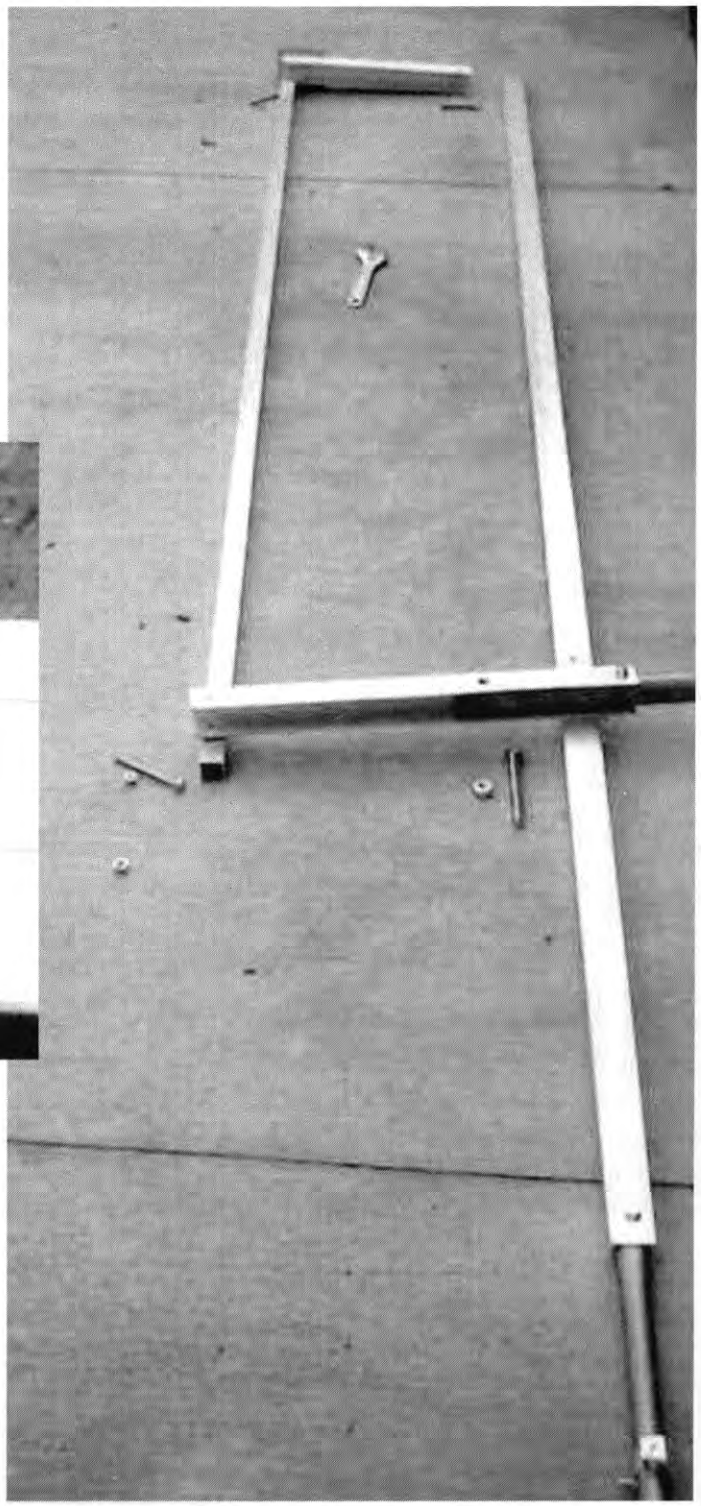


Make sure the nut is on the front side.

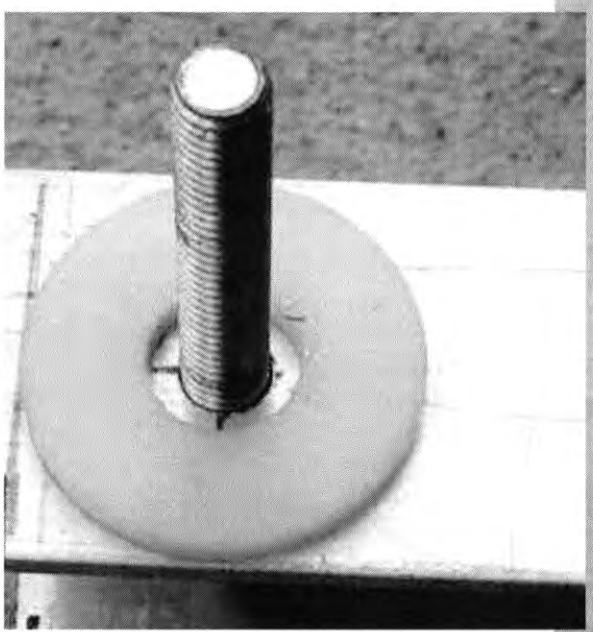
Let's slap this thing together

15.

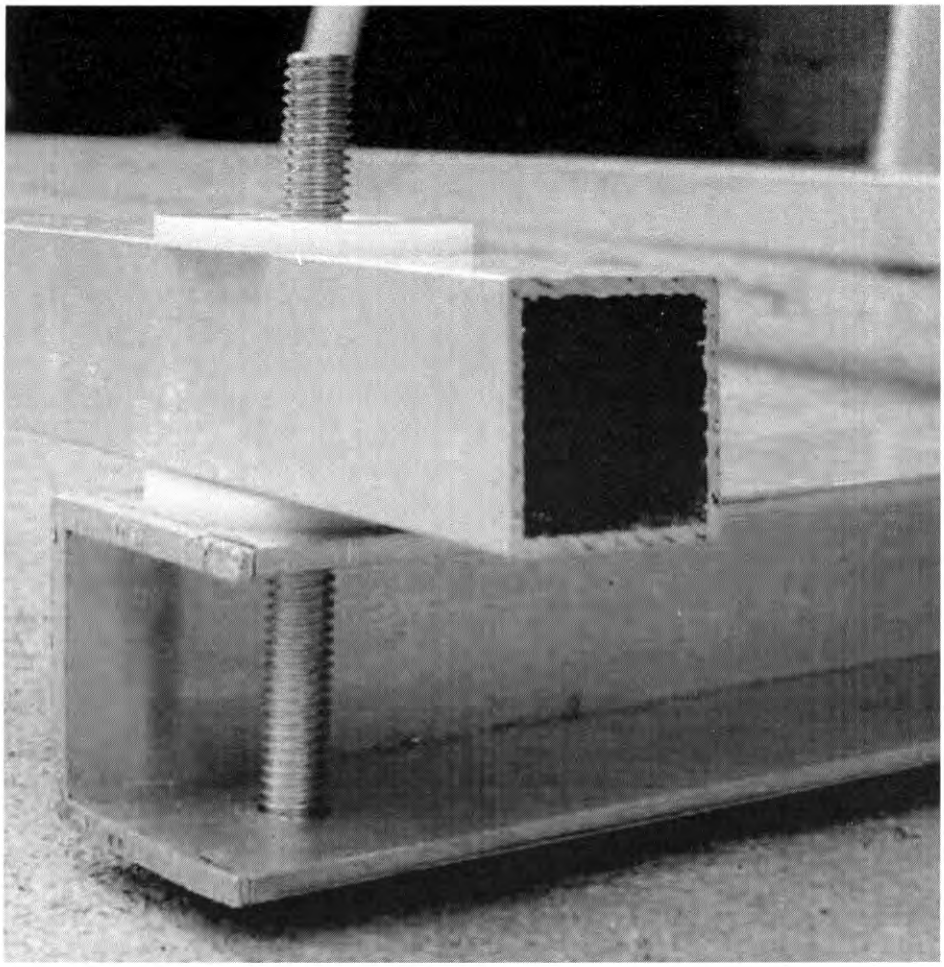
Grab all your crane pieces and lay them out...



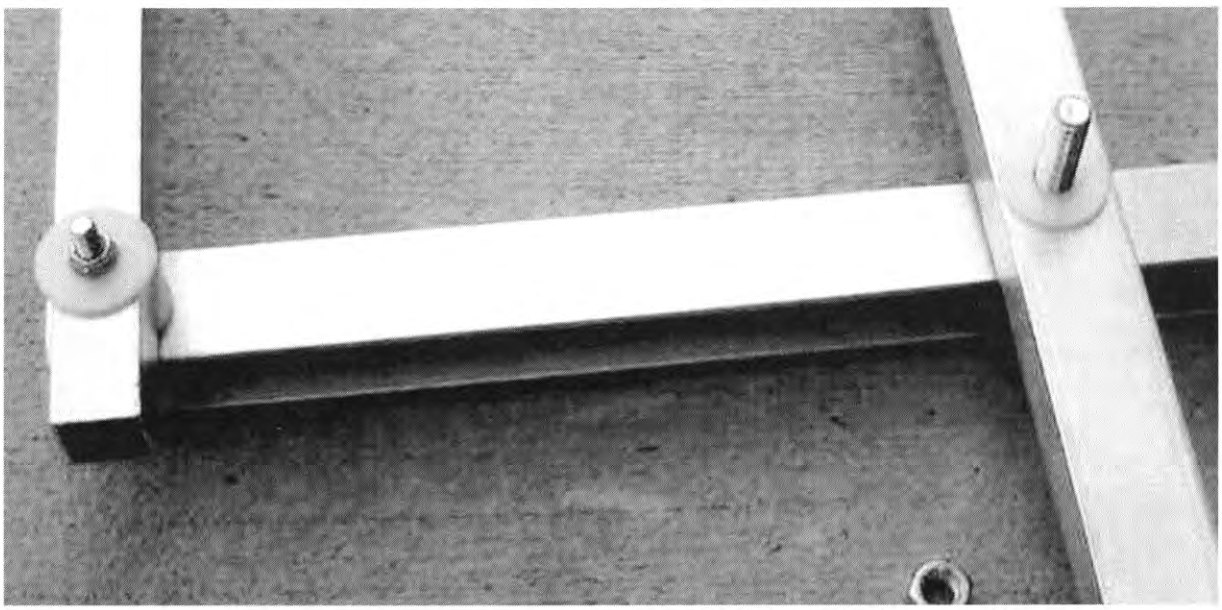
We're going to use nylon washers between all the moving parts: you don't want metal scraping against metal.



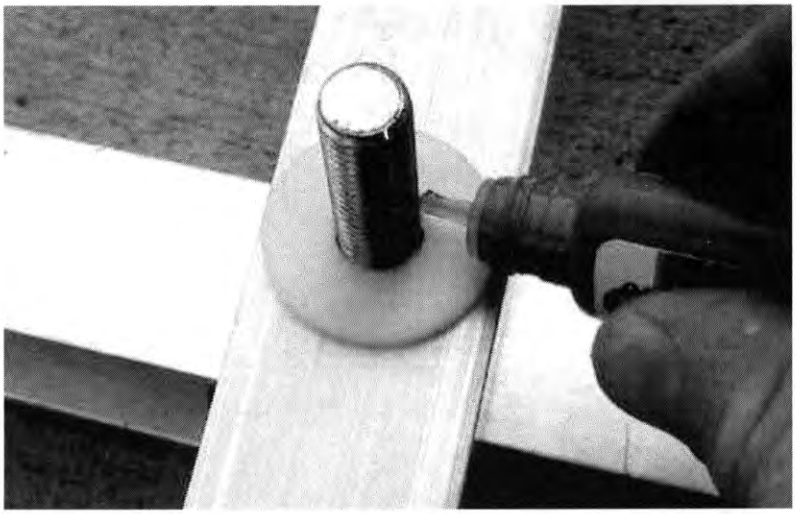
Put a bolt through the top of the support shaft and add a washer



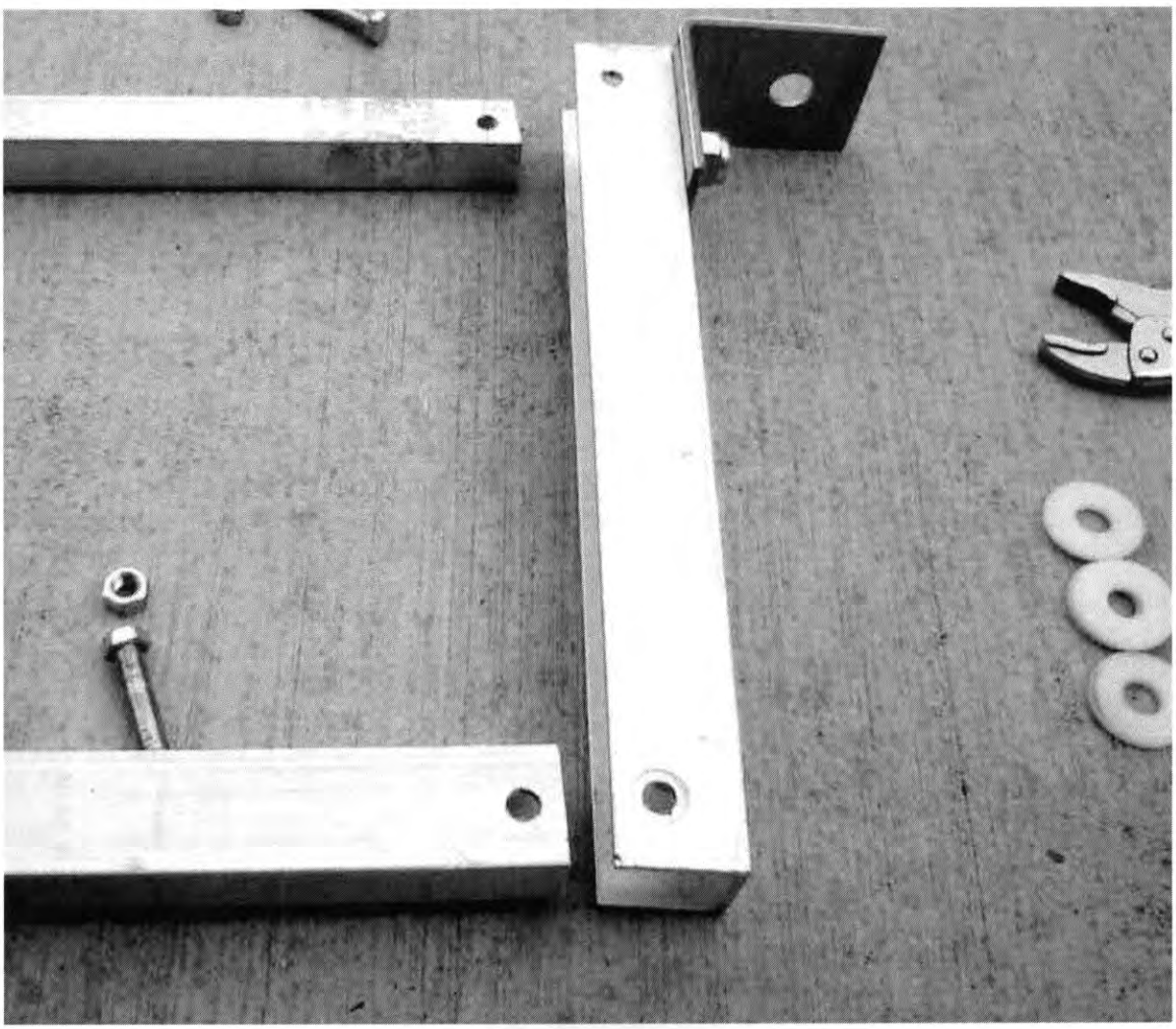
Slip the top aluminum bar over the bolt, add another washer and tighten on a stop nut.



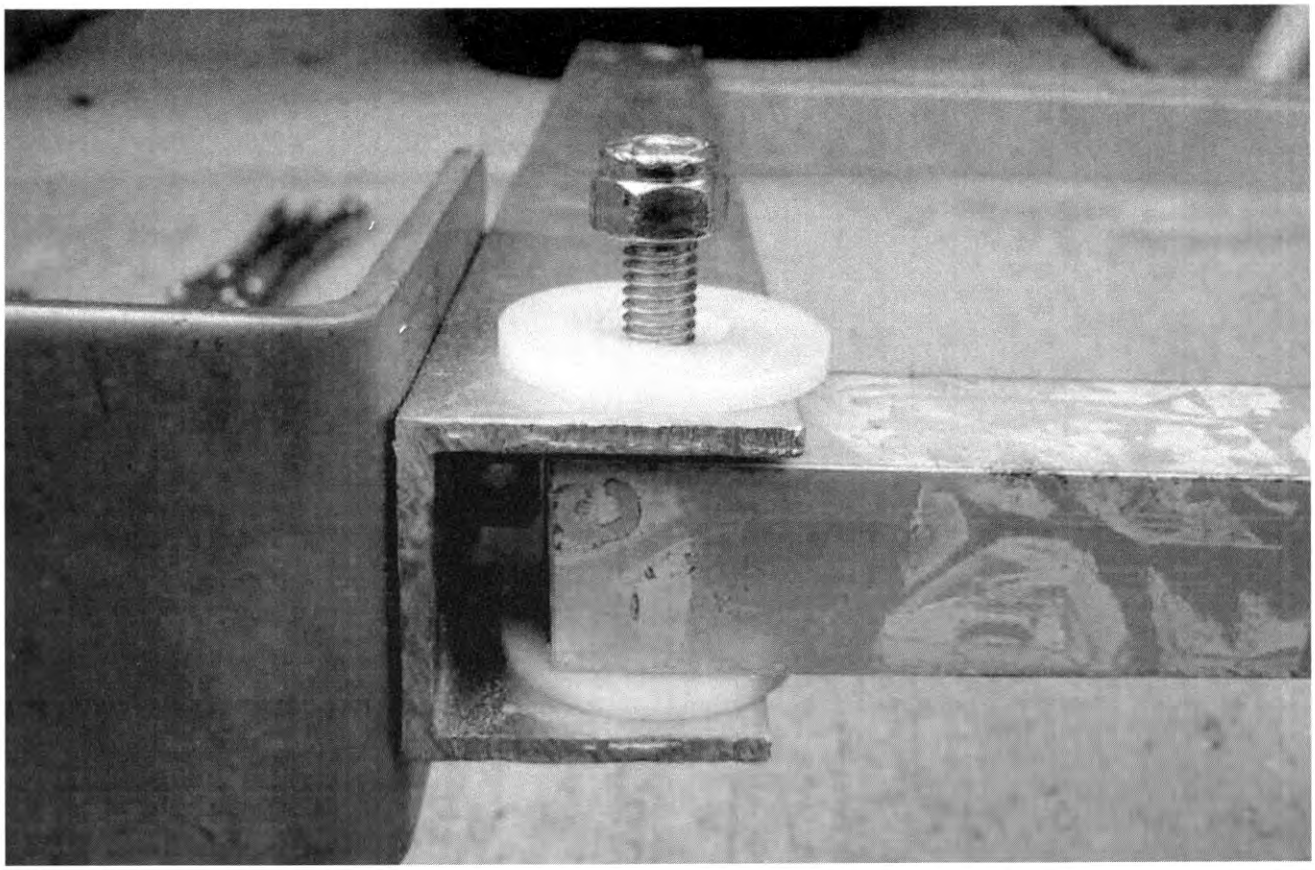
Do the same thing with the bottom support bar.



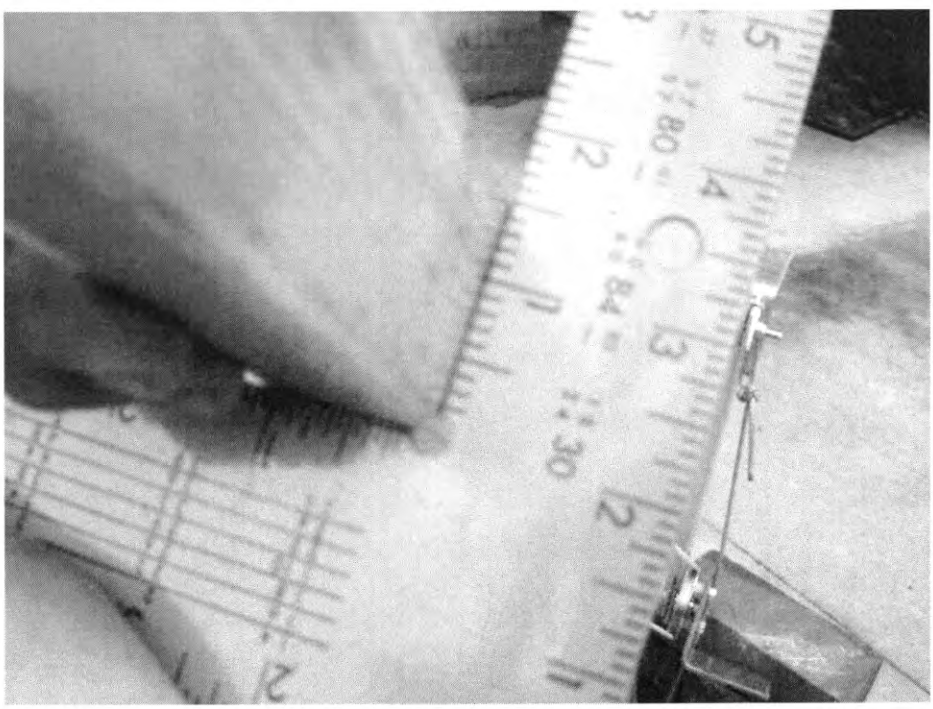
If you don't have a stop nut, make sure you use some LokTite.



Do the same on the camera mount end, but this time put the bars inside the channel aluminum.



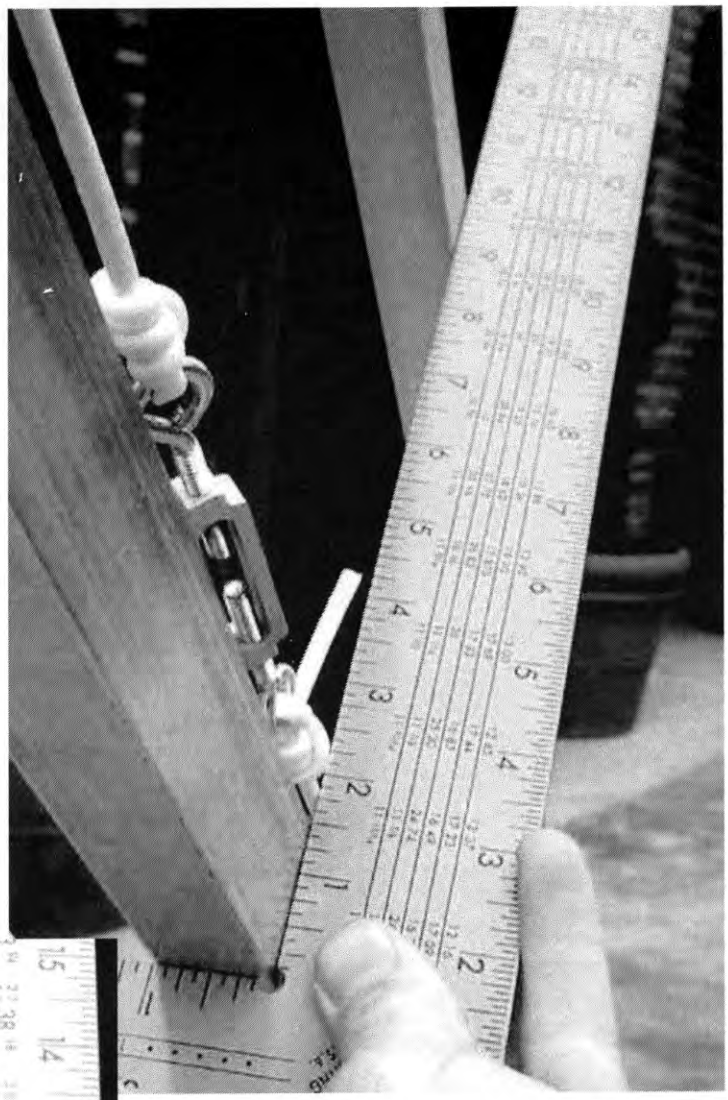
Do the same on the bottom.

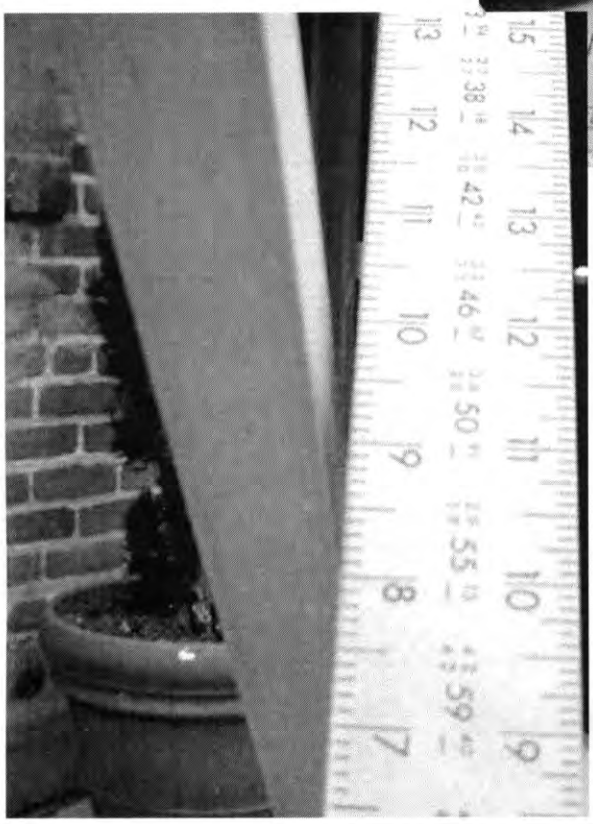


Now we need to make sure that the top and bottom bars are on the same plane.

Take a big square and set it flush on the bottom bar.

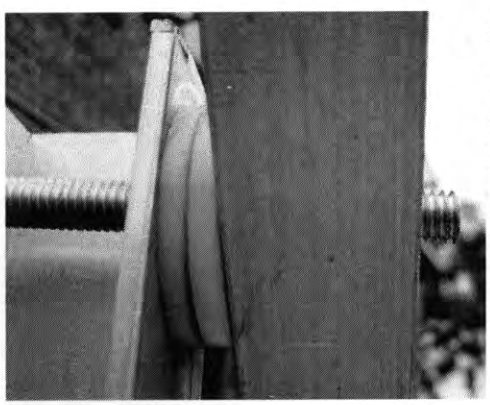
Does the edge of the square rest against the top bar like this?



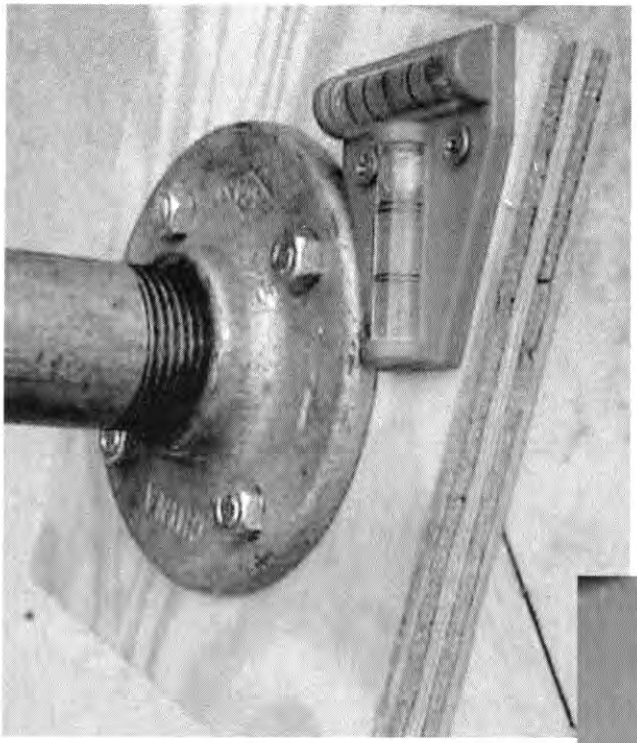


Or does it look like this with a little gap?

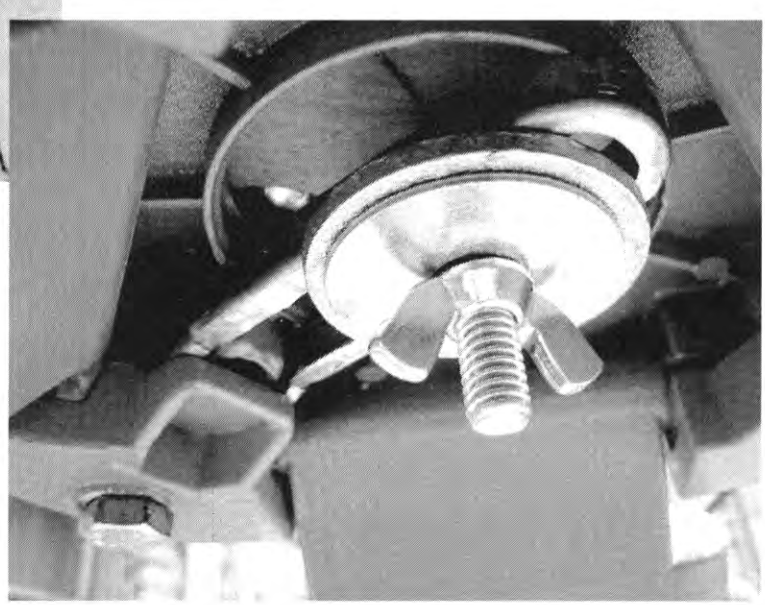
If it looks like this, you'll need to do a little adjusting.



Just add another washer or two to the top bar to move it out a bit until it looks like the above picture.

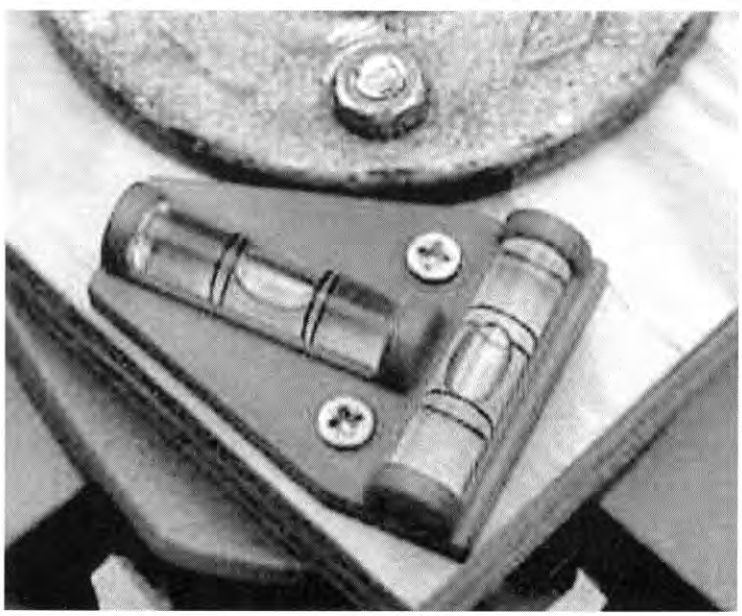


Screw your floor flange tripod mount on to the pipe that makes up the cranes support column.



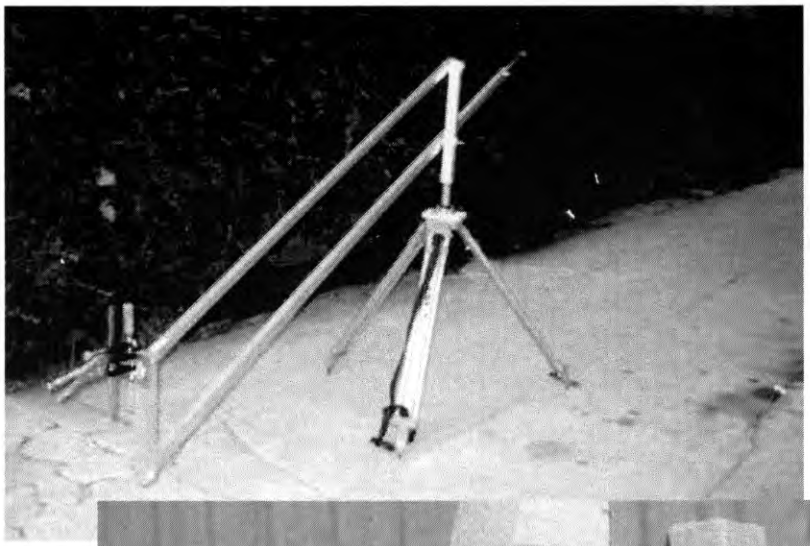
Then mount the whole she-bang on to your tripod.

If you're using a surveyor's tripod, make sure you toughen it up by following the instructions elsewhere in this manual.



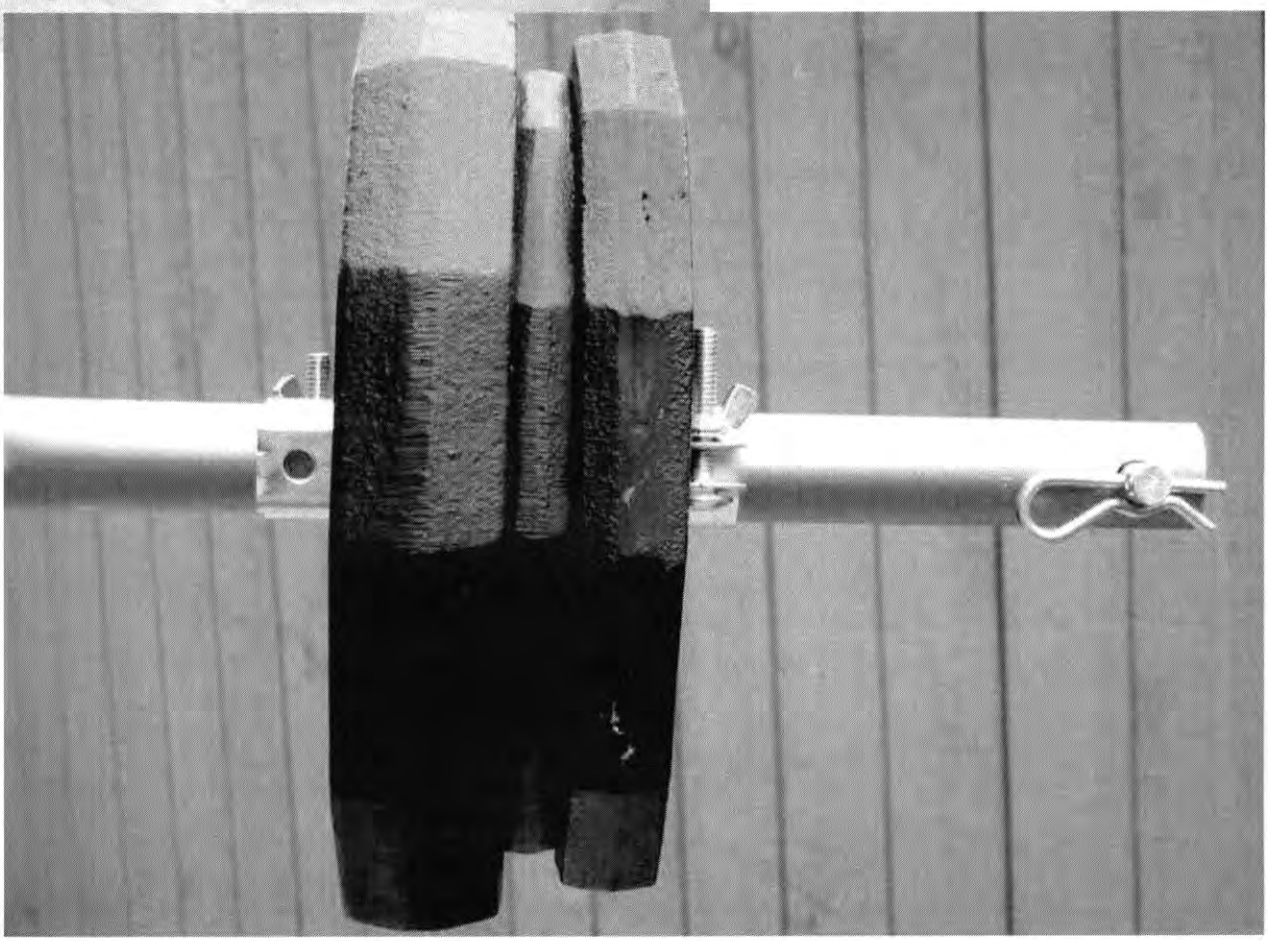
Again, I found this great little level that balances in all directions at once. They're only a couple of bucks, so it would be a really good idea to screw one on to your crane mounting platform.

BEFORE you put any camera or weights on the crane, make DAMN SURE it's level. Otherwise, things could get nasty in a hurry.



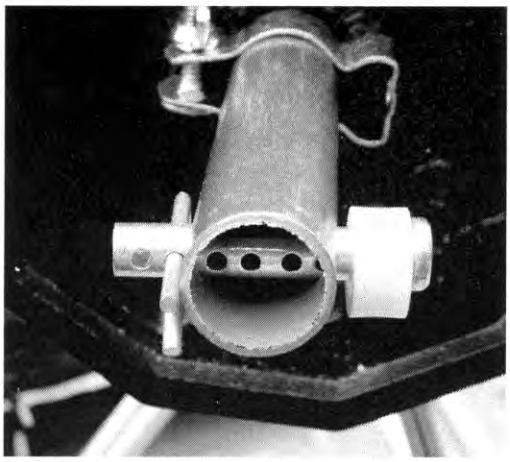
Hey, it's really starting to look like something, isn't it?

Let's take a look at our counter-weight system.



OK, here's what we have going on:

On each side of the dumb-bells I've put an electrical conduit hanger. If you built the Camera Stabilizer, you're already familiar with these babies. The only difference is that these are a little smaller to fit the smaller tube. These serve two purposes: to keep the weights jammed together so they don't clang around, and to allow you to move the weights as a group up or down the shaft for fine tuning your balance.

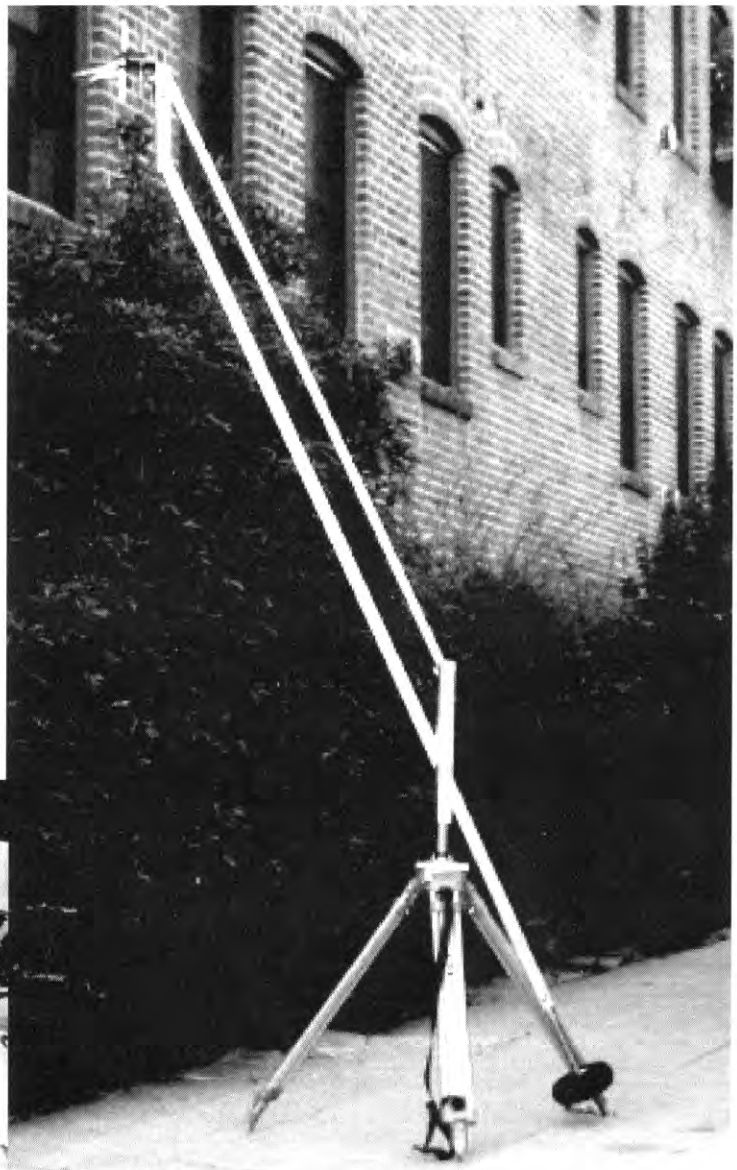


This thing on the end is called a clevis pin. It's there for safety. If the conduit hanger slips, this will keep your counterweights on the rig. Believe me, you DO NOT want these weight slipping off the end and sending your very expensive camera crashing to the ground. I've seen it happen! DO NOT SKIP THIS STEP!!

Let's take it for a test drive.

Put some weight on the front end (not your camera yet. Better test it first). I'm just using a bunch of clamps, wrenches and what-not.

Just fly it around and put it through its paces. Make sure everything is hunky-dory before you stick a camera on there.





Once you've checked the movement, and everything is fine, take a hacksaw and cut off any bolts that aren't flush to the top of the bolt.

Make it Groovy

As you may have guessed by now, the crane you just made keeps the camera on the same plane. No tilting. For most people this is plenty of crane. Fact is, most commercially made booms in the $500 to $3000 price range works this way. (Not too shabby for around 50 bucks, huh?!)

Dig a little deeper and for about another $25 investment we'll put a tilt head on this puppy.

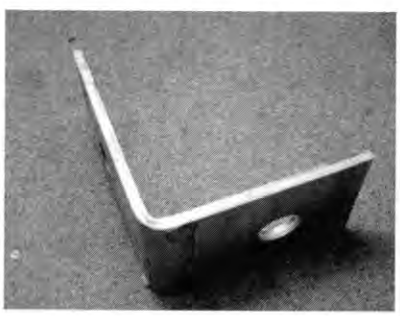
Here's what you'll need:



(2) 3" or larger garage door pulley. Some manufactures make them with holes, some don't. Try to find one with holes, or you'll have to drill some. This one is made by Prime Line.

Here's what it looks like out of the package:





(1) 3" simpsons strong tie L-bracket (Yep, that's 2 in all).



(1) Turnbuckle.



(4) 1/4" flat head bolts by 1.5" long. These will go through the outer holes of the pulley. These measurements are for this pulley. Just try to find a bolt that doesn't wobble around in the hole.

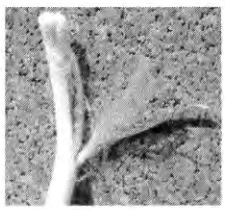


(6) 1/4" nuts

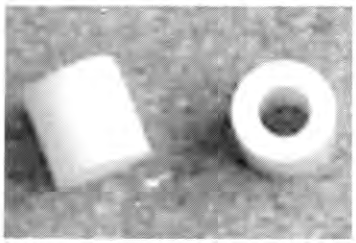
These are for the above bolt



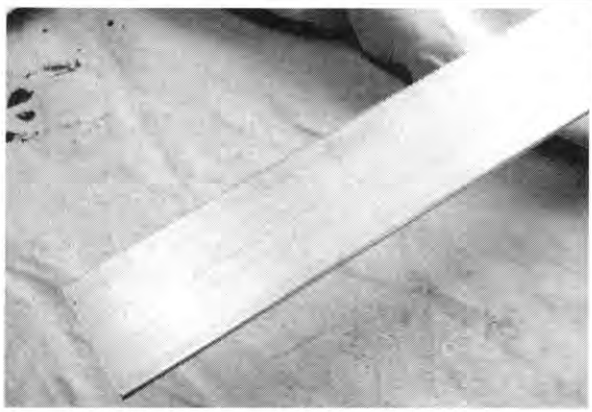
(4) 1/4" jam nuts (these also go on the above bolt). A Jam nut is about half the thickness of a regular nut. ☐



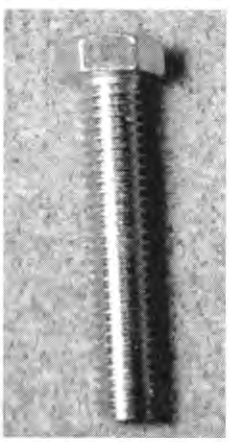
Get a package of clothesline. Get the stuff that is plastic coated with a wire core inside. ☐



(2) Nylon spacers. These need to have a hole big enough to slip over the above bolt and should be about 3/4" long. You can also buy shorter ones and stack them. ☐



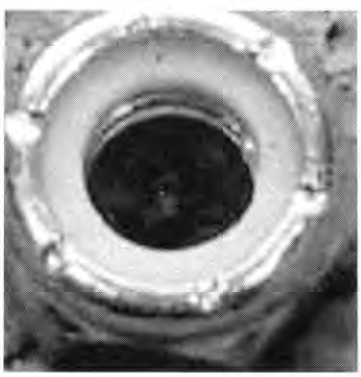
(1) flat piece of aluminum about 9" long by 1.5" wide by 1/8" thick. These measurement aren't written in stone. This is going to be the arm to the tilt handle. ☐



(1) 5/16" by 4" -6" long bolt for the handle. Or if you're making the Stabilizer, you'll have some threaded rod left over. Use it.

Speaking of handles...

I'm making the same handle I use on the Stabilizer, but a handle can be a simple as a wooden dowel with a hole drilled down through it and slipped over a bolt. ☐



(2) 5/16" lock nuts for the threaded rod. Lock nuts have a nylon ring that holds it tight to the bolt. (You might also see these called "Stop nuts"). ☐



(2) 3/8" bolts by 3" (or long enough to go through the wheel hub and the width of your bottom aluminum boom.



3/8" Drill bit.



(2) In-line skate wheel bearings.



1" outside diameter aluminum tube about 5" long.

If you made the Stabilizer, you'll have plenty left over for this handle



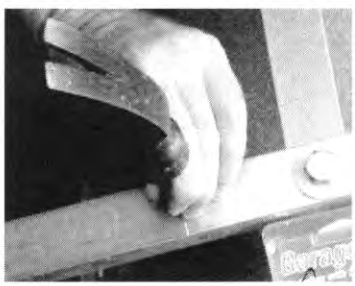
A package of J-B Weld

Let's build it



On the bottom support arm, we're going to need to drill a hole to hold the wheel. I'm going to put this one about 3.5" in front (towards the camera end of the bottom arm) of the support column.

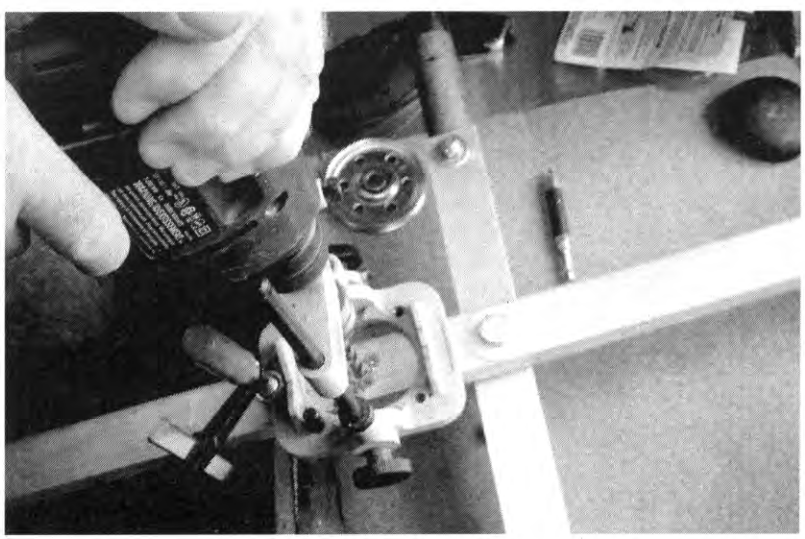
The hole in the center of the wheel is 3/8", so that's the size I'll drill through the support arm.

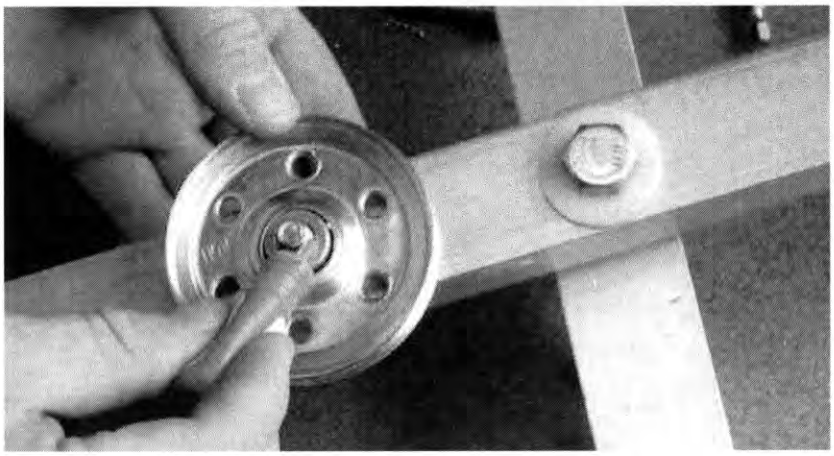


Make your dimple to keep the drill bit from walking!

Make sure you drill straight and true!

If you have this very handy rig, clamp it right on the aluminum and drill away.

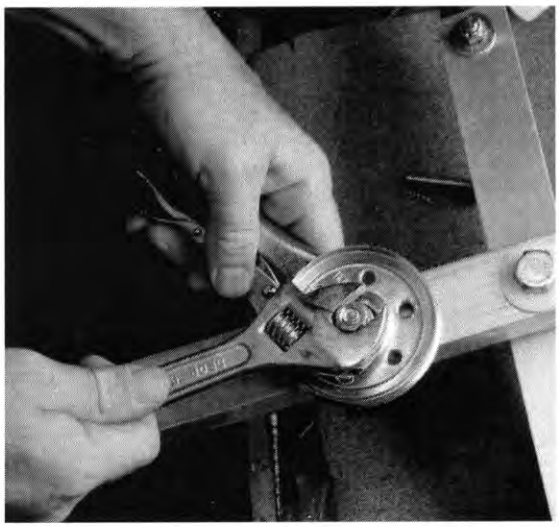


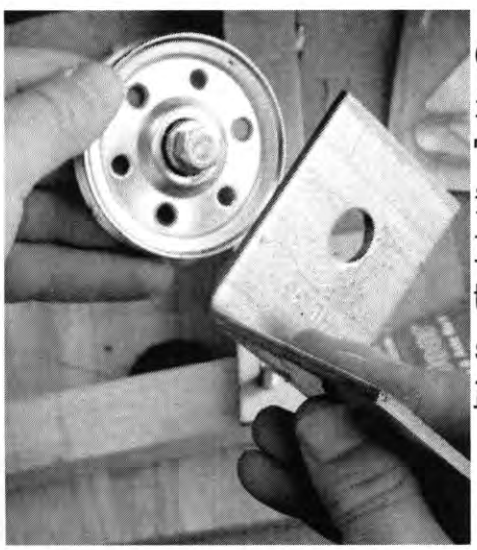


Slip your 3/8" bolt through the hole and the pulley wheel. Add some "lok Tite" and muscle a nut down on the whole thing. **UNLESS! You're going to be painting the crane, then don't add the nut lock goo until after the painting.**

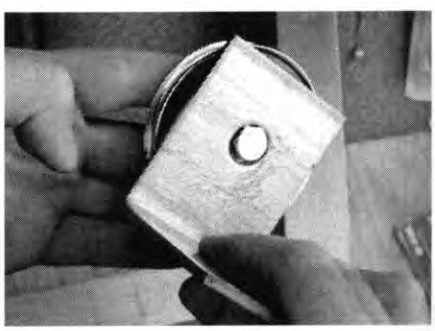
IMPORTANT:

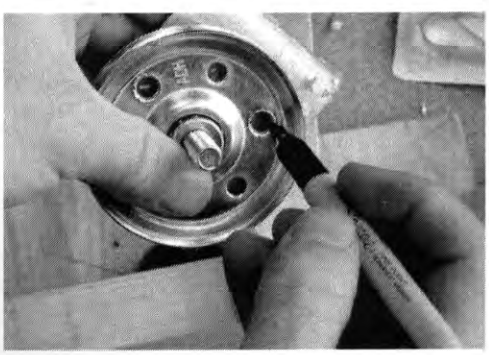
If your bolt extends beyond the top of the nut, take a hacksaw and cut it off.



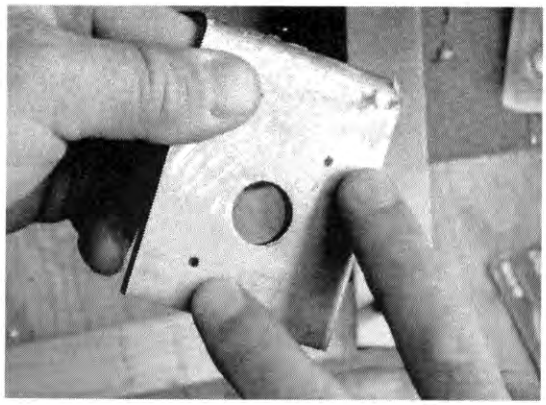


On the second wheel for the camera end: Take your bolt and slip it through the center hole in the wheel. Then take the L-Bracket and slip the hole over the bolt.

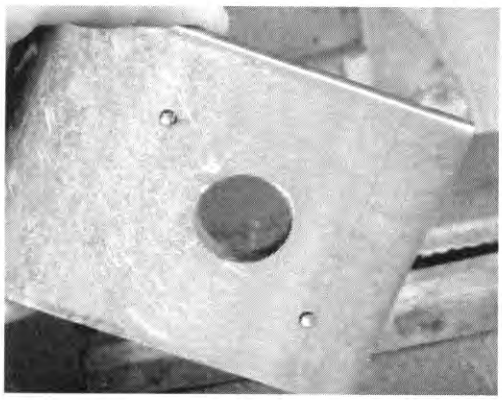




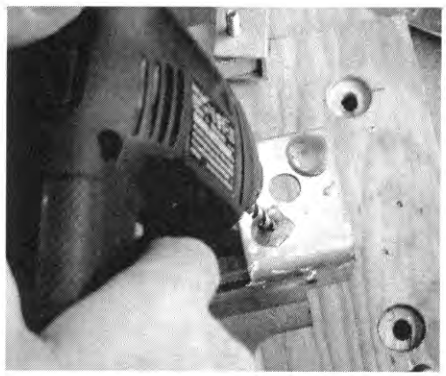
Holding the wheel in place on the bracket, flip it over and mark the place of two holes that are opposite one another.



Your marks should look like this.



Make your dimples, clamp the bracket in your vise and drill 1/4" holes for your bolts.

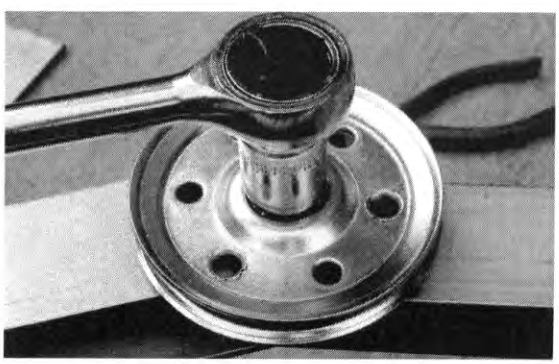




The second pulley wheel will go on the existing hole at the front of the crane.

You'll need a longer bolt to account for the thickness of the wheel.

Bolt the wheel to the front of the bottom arm.

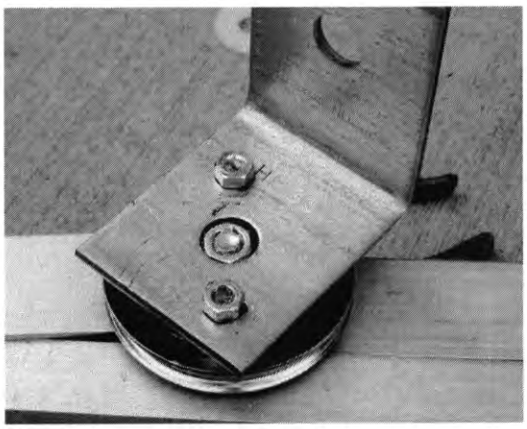




Slip your 1.5" bolts up through opposite holes on the wheel.



Slip the nylon spacers over the bolts...



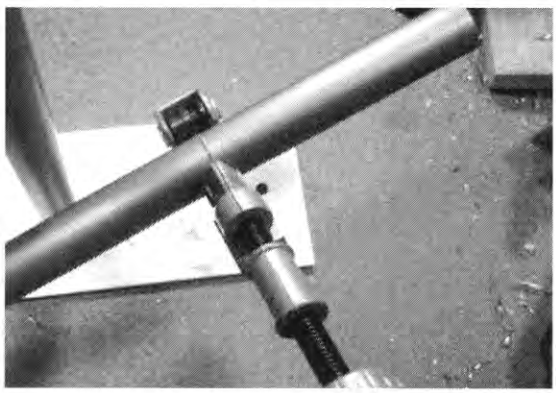
Slip the L-bracket on to the bolts, and tighten nuts down on the thing. For the love of God, Man, don't add the lok-tite yet! We've got some checks to do in the next section! Didn't you read ahead?!!

Do the same to the wheel at the back of the crane, but instead of spacers, tighten nuts down against the wheel so that the bolts don't move at all.

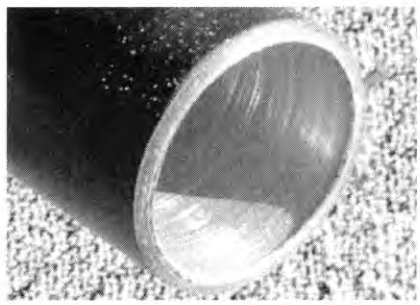


Now let's make the handle unit. Ok, here's the deal: the handle can be something as simple as a wooden dowel with a hole drilled down the center. But I'm going to make mine from aluminum tube and bearings, just to be difficult! If you made the stabilizer, this is the same handle.

Cut a 5" piece off the 1" OD tubing.

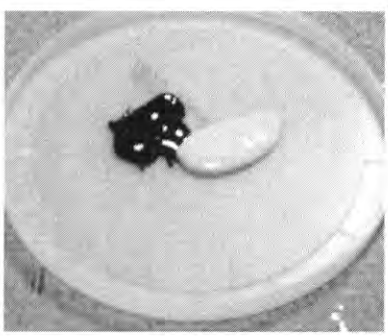


Roughen up the inside of the tube on each end with sandpaper...



...do the same on the outside of the bearings. Wipe everything clean.





Squeeze an equal amount of JB Weld onto a lid and mix it fully. A popcycle stick works great (although, I prefer an Eskimo Pie stick.)



Glup a thick layer of the JB Weld all the way around the outside of the bearing. Be careful that it's only on the outside.

Now, these in-line skate bearings fit perfectly into this 1" O.D. tubing. Coincidence? I think not!



Slide the bearings into the tube--one on each end--and wipe away the mess that oozes out. Make sure these are sitting straight inside the tube!

As you can see, on one end of the tube I've set the bearing flush with the top. On the other end I've inset the bearing just a bit. This is to hide the nut that will be on the bottom end of the handle. This isn't necessary, it just looks nice.

Set the whole thing aside for 24 hours to let it dry.

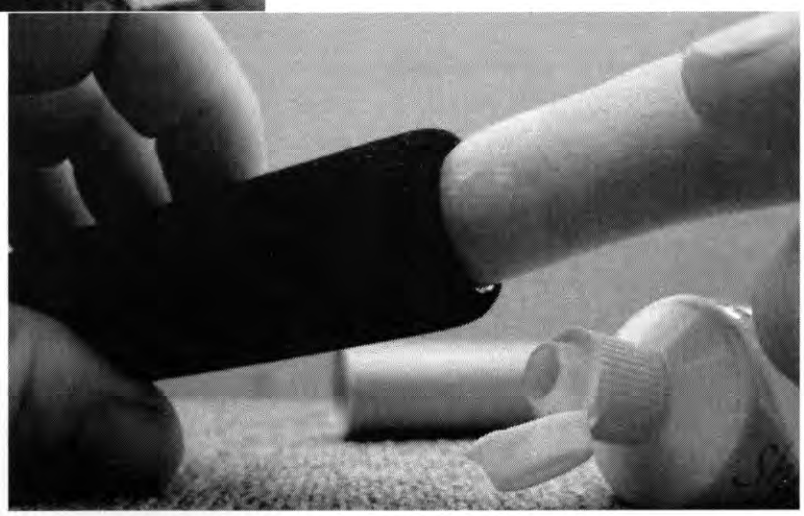


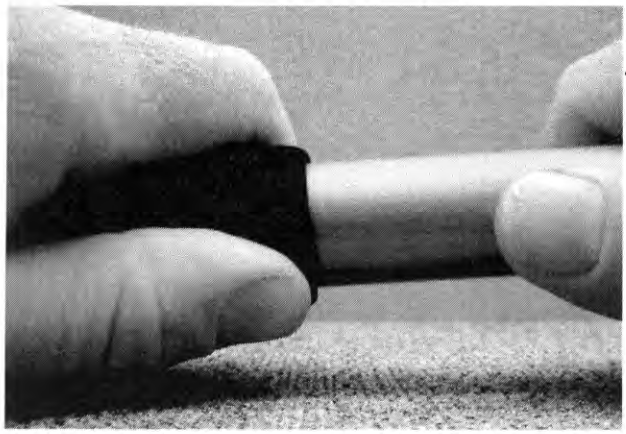




Cut the threaded rod to the same length as your handle tube, plus 1/2" (or about 3/4" if you didn't inset the bottom bearing).

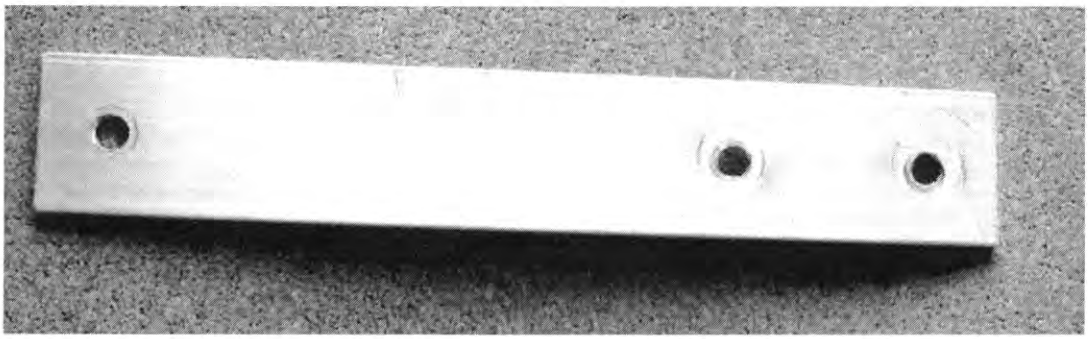
Take some "personal lubricant" and oil up the inside of the foam handle. Do NOT use a petroleum based lubricant. This will eat away at the foam.





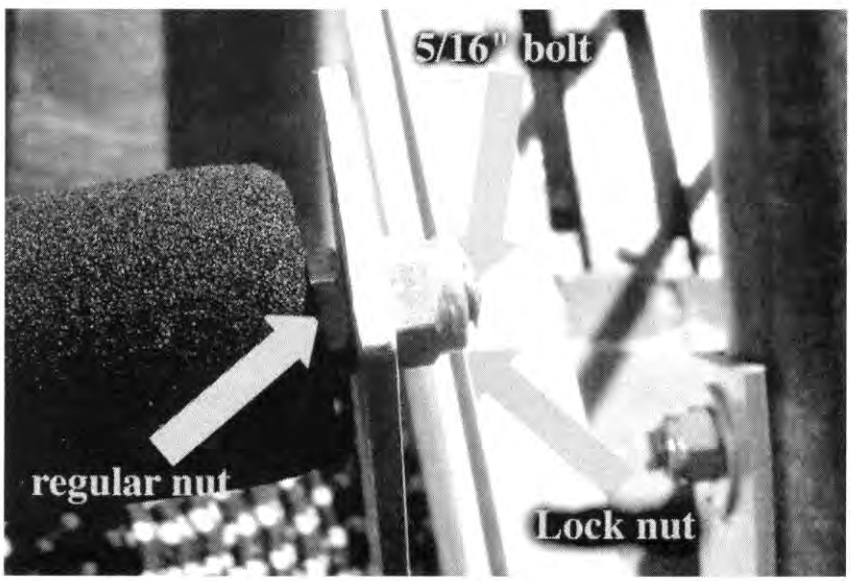
Muscle the foam onto the handle and wipe away any lubricant that oozes out.

OK, set that aside for the moment and let's make the bar that holds this handle. You should be an old hand at drilling by now, so I'm just going to tell you where to place the holes.



Take your 9" piece of aluminum and drill 3 holes. The 2 on the right should be the same distance apart as the bolts you just put in the wheel. Use a drill bit that fits the size of the bolts you used.

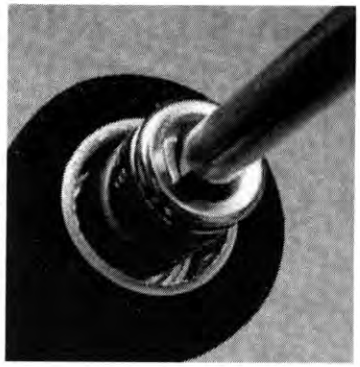
The hole on the left will hold the handle. If you are making my handle, you'll need to drill a 5/16" hole or a tad larger.



When you attach your handle to the bar, screw a regular nut a little way down on your threaded rod. Slip the end of the rod through the hole on the bar, then add a lock nut. Tighten the lock nut and regular nut against each other, then slip the handle on the rod.



Slip the handle on the bolt and add another stop nut at the bottom of the handle. A socket is a big help in tightening this down. Don't tighten too much. You want the handle to turn without moving up and down.

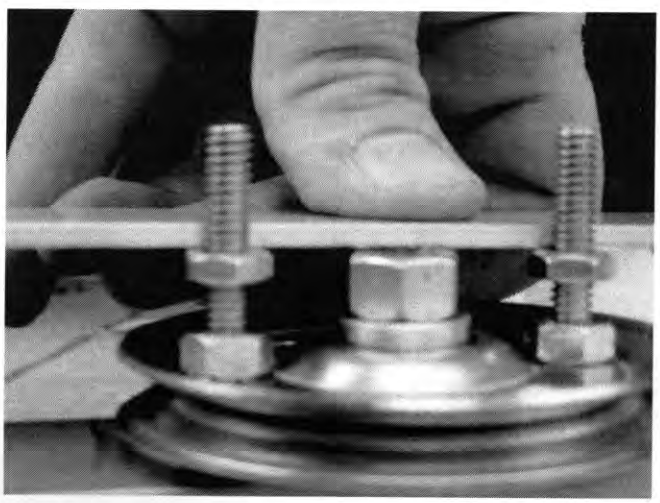


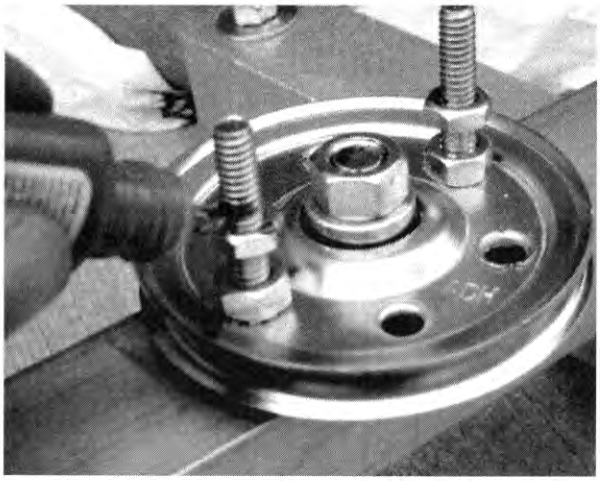


Ohh, look how pretty!

Attaching the handle to the rig

Take a couple of Jam Nuts and screw them down even with the top of the nut that holds the wheel. I'm using the handle bar to make sure they're even.





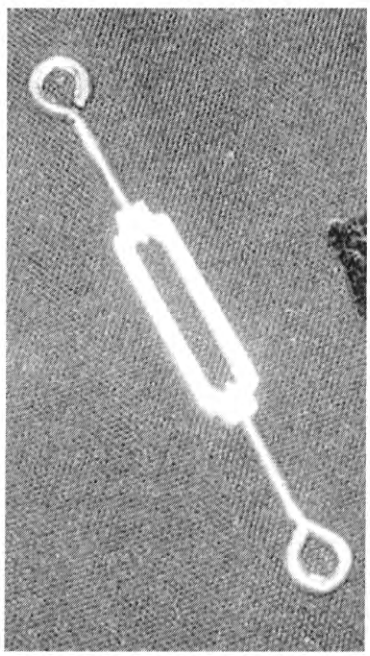
Add some lok Tite to the bolts above the nut.



Tighten a second Jam Nut against the first. Be careful not to let the bottom nut move from its position.

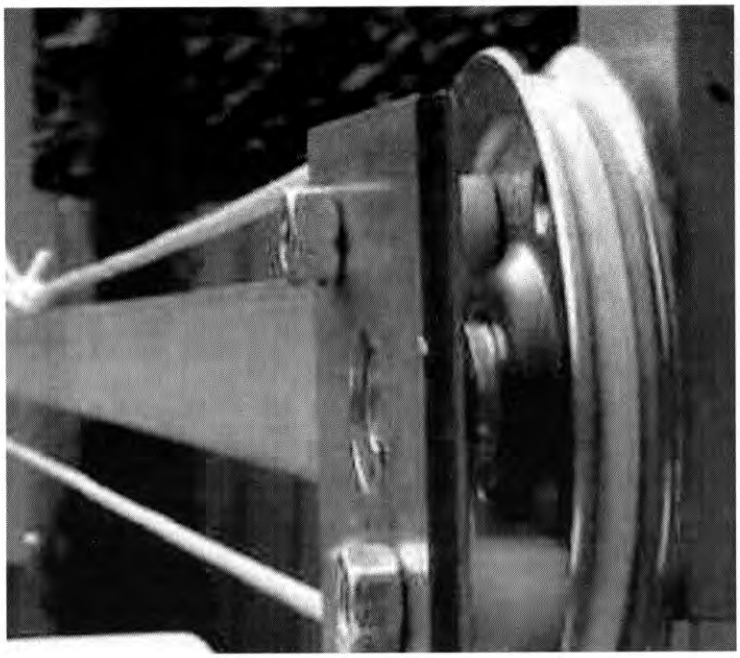


Slip the handle over the bolts and tighten some nuts over the handle arm.

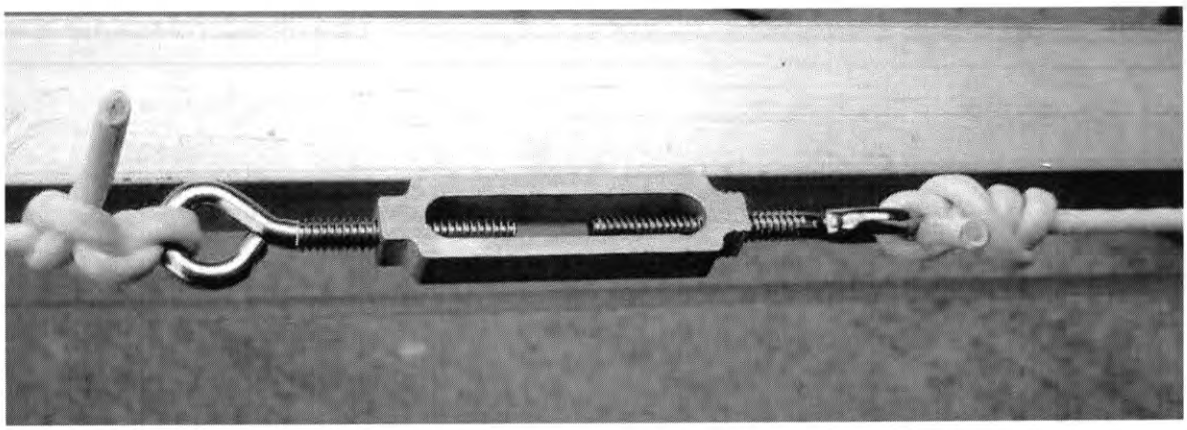


Take your turn buckle and unscrew the screw-eyes to their farthest extension.

Tie one end of your clothes line through one of the eyes.

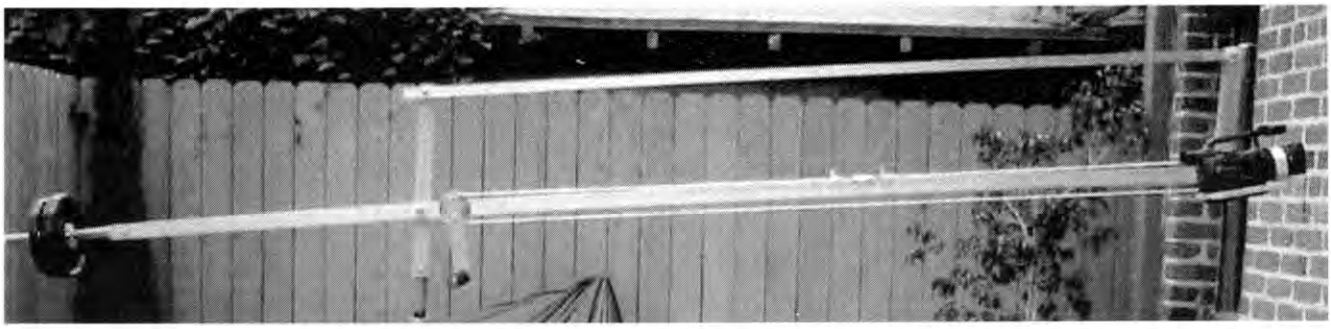


Loop the clothes line around the pulley wheels on each end.



Pull the other end of the clothes line through the other eye and pull it tight.

Tie it down, keeping the line taught. Then turn the center buckle to take up any slack.



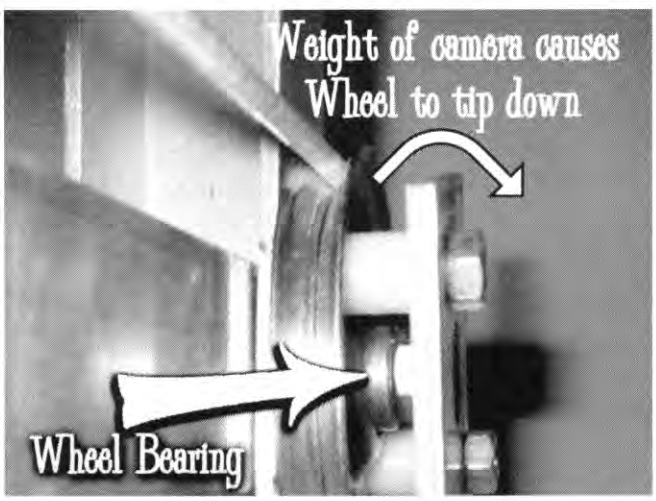
There ya go. Give it a turn. It should work quite smoothly.

Hey, I can't fit my camera on the L-bracket!

Yep, the smaller cameras fit nicely within the existing hole on the tilting L-bracket, but the larger ones need a little more room. You can also make a super sized camera plate. Just copy the plate instruction for the **Big Carnival Crane.**

In this section we're going to be drilling another hole for the camera bolt, and checking out a flaw in the wheel the L-bracket is attached to. This is why I didn't want you putting any lok-tite or similar product on to freeze those nuts in place. We're also going to build a little extension to make the bottom of the "L" a little longer. You can make this out of plywood or better, aluminum. It's very important **NOT** to build this extension out farther than you actually need to hold the camera. You must keep this as light as possible.

First, let's explore this little flaw in the wheel bearing.



Take a close look at the photo to the left. See the arrow that points to the bearing? Well, it's a little loose for our needs, so the weight of a larger camera causes the wheel to tip ever so slightly. If you can find a similar wheel and bearing that isn't a little loose, let me know, because I couldn't! Frankly, it's an easy fix, so let's get it on!



Okey, dokey. Remove the L-bracket from the wheel and head for your workbench.

Set your camera on the bracket, but leave a little space between the vertical part of the bracket and your camera. About 3/4" should do it. You need enough room to clear the bolts that hold the bracket to the wheel. Now, turn the whole she-bang over.



Take a look at where my forefinger is. That's the bolt socket on the bottom of my friend Scott's camera. (You didn't think I'd be experimenting with my OWN stuff do you?) Now, if we slide the bracket straight back, will the existing hole (huge as it is) match up with the one on the camera? Nope. Not in this case. Not this fine Sony. If it did line up, you can go eat dinner. The rest of you, read on.



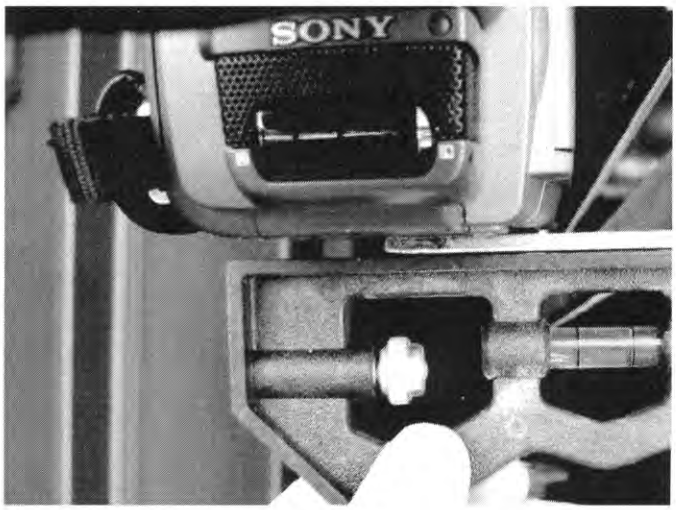
Take your punch and make a dimple about half-way between the outside edge of the bracket and the existing hole. AND dead center. If you've got a 2" wide bracket, that's an 1" in, Junior.



Put a 3/16" bit in, add your oil, and drill away. Since this is a harder metal than aluminum, go a little slower. AND DON'T FORGET THE SAFETY GLASSES!

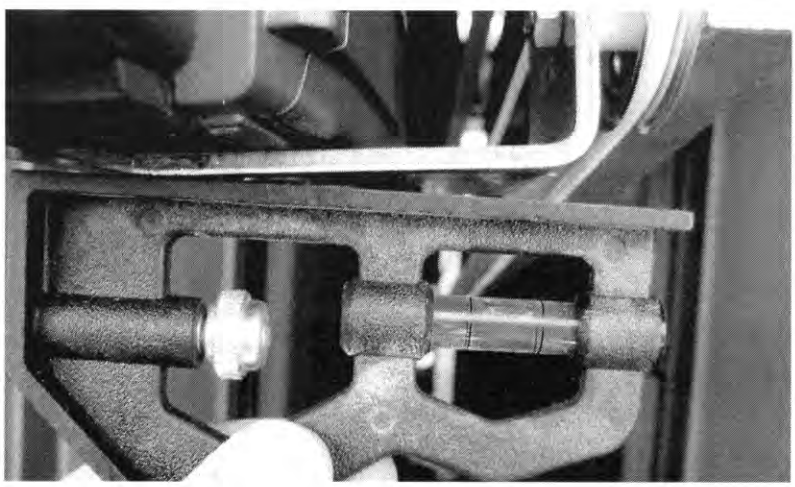
You can make this hole smaller if you want. Camera screws are only 1/4". I just don't know what the future holds, so I went a little larger than I needed.

Here's where things get really tedious. But a little care now, will save you a ton of headaches later.



Set up your crane according to the earlier instructions. AND MAKE DAMN SURE YOUR TRIPOD IS **LEVEL!** IF IT'S NOT, ALL YOUR WORK FROM THIS POINT WILL BE BOGUS!

Attach the camera through the new hole. It's ok that the camera doesn't rest entirely on the bracket. So do you notice that the weight of the camera is making our wheel tilt? Take a level and hold if flush against the bottom of the bracket. Not anywhere near level is it?



Tilt the level on one side until the bubble is in-between the two marks. See that gap between the bottom of the bracket and the top of the level? That's how much we've got to bend that bracket.

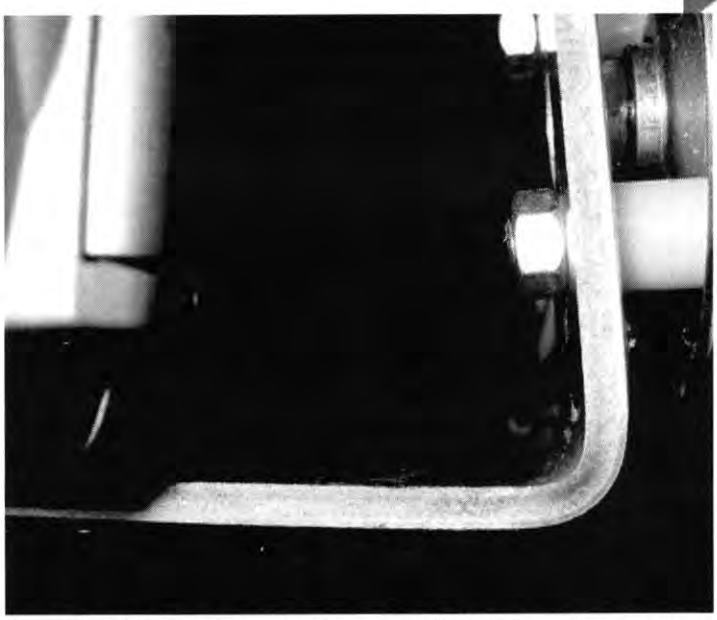
So, take the camera off the bracket and the bracket off the crane and head back to the bench.



Clamp the bracket in your vice and give it a few good thwacks with a hammer. Once you've got the camera side of the bracket bent up a bit, take it back to the crane, re-attach it, and put the camera back on. I did warn you this was tedious. Doing a bit at a time is the way to go here, though.

Damn. Close, but not perfect. If yours isn't perfect either, take the camera off the bracket, the bracket off the crane, and go do some more thwacking.



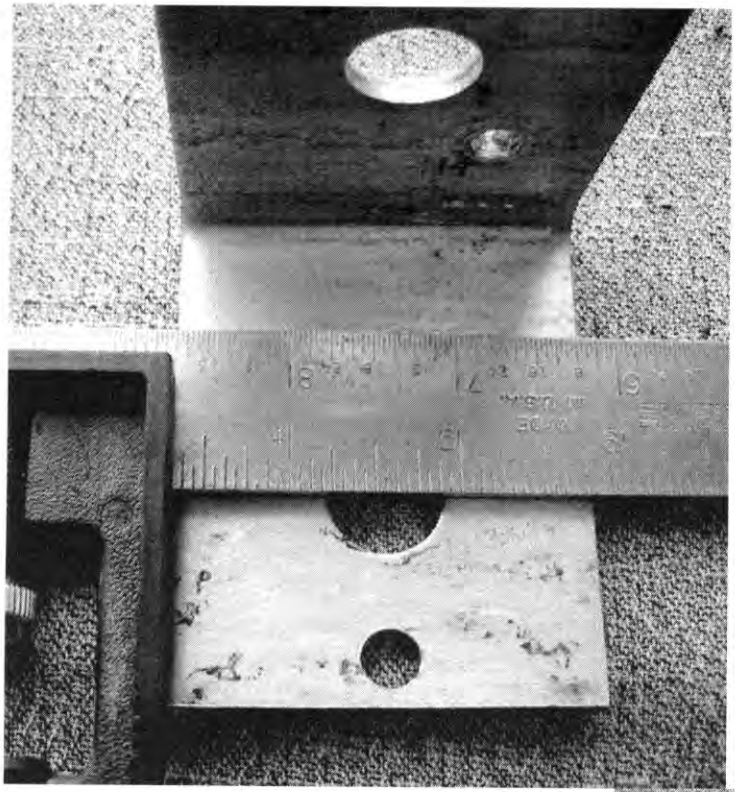


Just to give you an idea...

This is how much thwacking I had to do before the camera was perfectly level.

Now, at this point it is possible to stop, eventhough your camera is hanging off the bracket a bit. Just glue some cork on the top of the bracket and you're done. You can't use the mouse pad trick here. Because the camera is resting only partly on the bracket, if you cushion it with anything thick and squishy, the camera will slowly go out of level as you tighten the camera bolt down.

If you want to make things even **MORE GROOVY**, keep going.



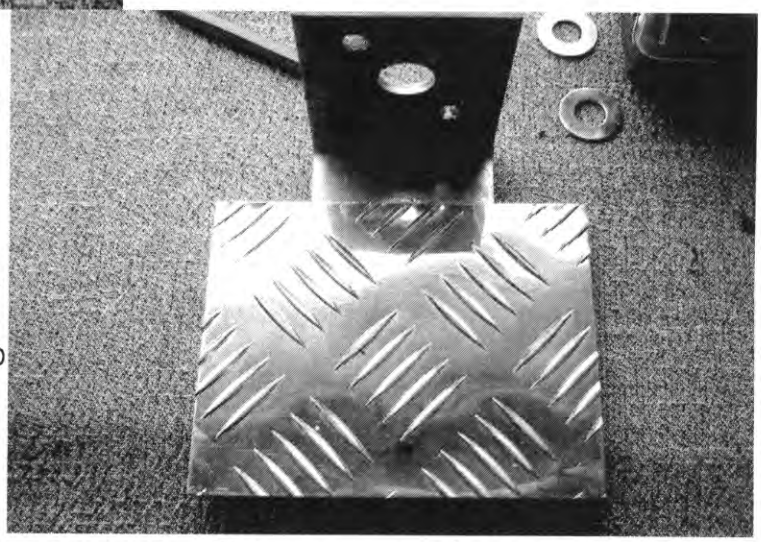
Take the camera off the bracket and the bracket off the crane ... you know the drill.

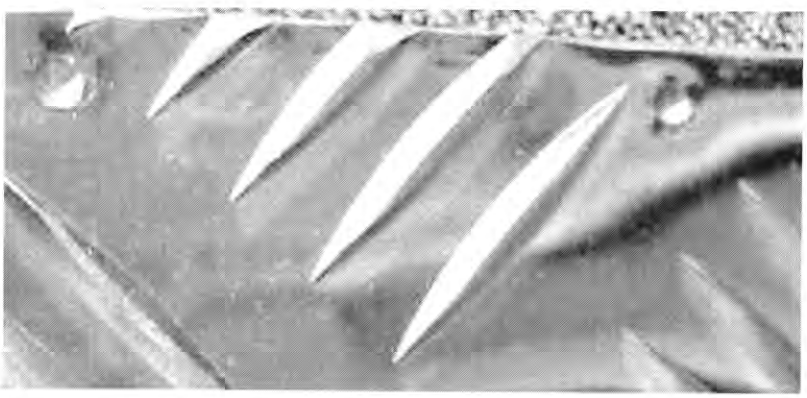
We're going to add a camera plate to this baby.

Take your square and draw a straight line across the camera mounting side of the bracket, about 3/4" in from the crane mounting side.

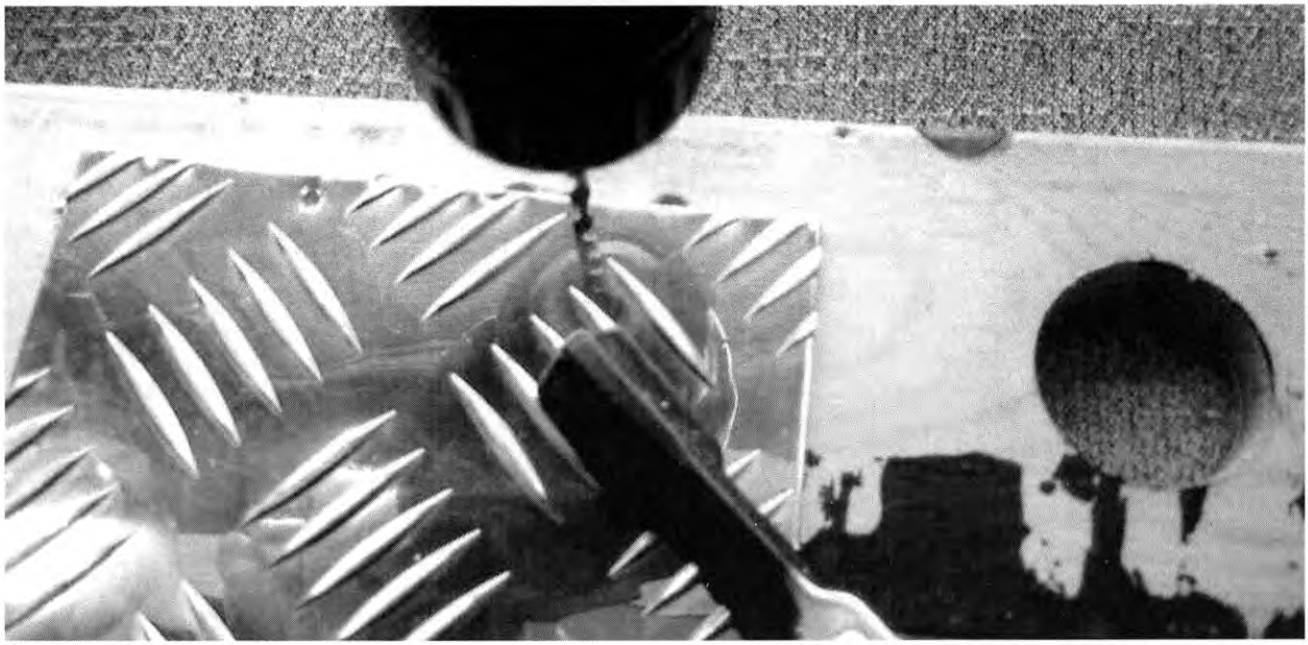
Take a square of plywood or aluminum and center it on the bracket at the line you just made.

I got this nice little piece of aluminum for nothing. It's 1/8" thick, super light, and measures 4" by 5". It's perfect for this job. Don't be too proud to beg at your metal supply shop!





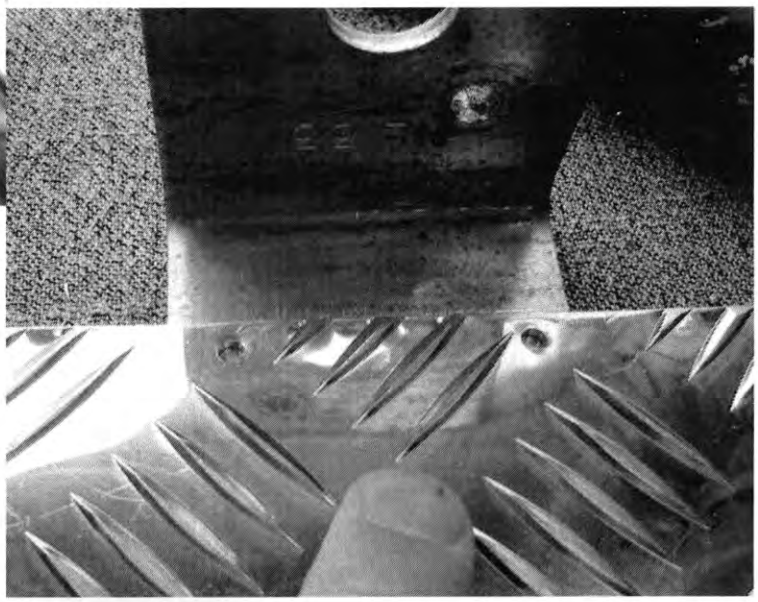
Take your center punch and make a couple of dimple at the edge of your new plate. These should be placed just a bit narrower than the width of the L-bracket while the new plate is centered on the bracket as in the above photo.



Clamp the plate to your bench on top of a piece of scrap lumber. Load a drill bit up that's just a bit larger than the bolts you're going to use. In this case, I'm using an 1/8" bit. Drill out the holes on your dimple.



BEE-U-T-FUL!



Line your freshly drilled plate on the L-bracket. Line it up against the straight line you made earlier. It MUST be straight on the bracket!

Take a marker (a felt tip works great) and mark through the two holes on your plate.



It should look a little something like this. The line above the two marker holes is a reference line I made to make sure the plate was straight and true.

Make dimples on the hole marks. Give the center punch a good whack or two. We're dealing with steel now.

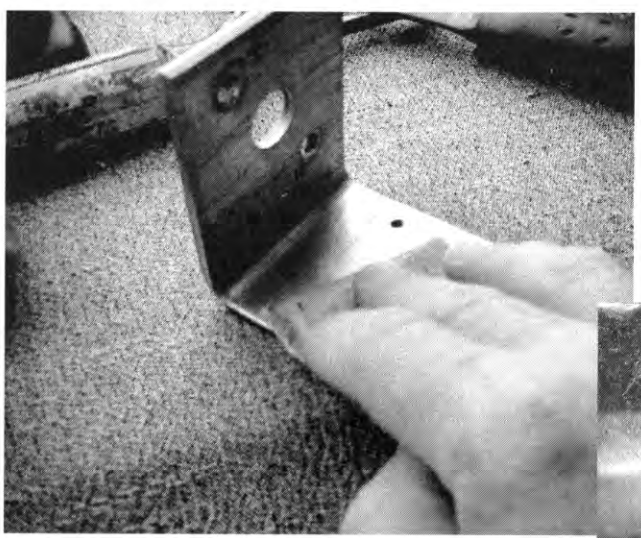
Make sure you use some drill oil. You'll probably have to stop drilling a couple of times to add more oil because of the much denser metal. Your bit needs to stay "wet".

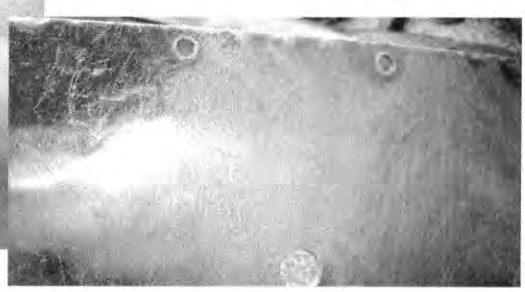


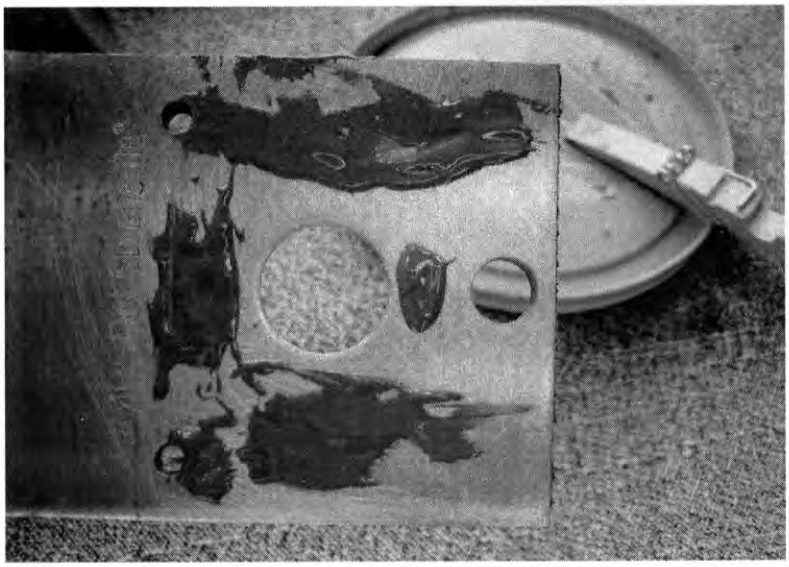
Clean off the oil and metal shavings.

Take a coarse piece of sand paper and roughen up the base of the L-bracket.

Do the same on the bottom of the plate.







Clean up the two pieces you just sanded.

Mix up a bit of JB Weld and glop some onto the top of the L-bracket.



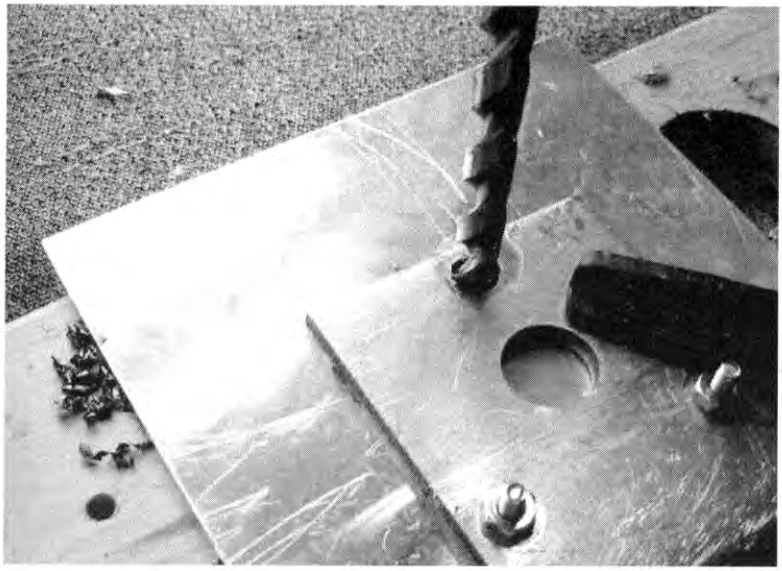
Bolt the plate on to the L-bracket.

Hurry, before the weld dries!





Flip the whole she-bang over and clamp it to the piece of scrap lumber one more time.

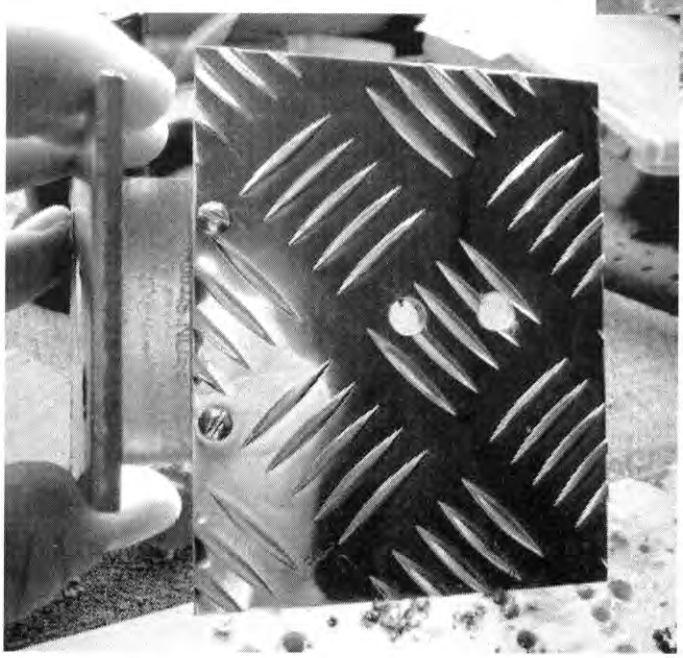


Drill a 3/16 hole through the plate, using the 3/16" hole you drilled earlier as your guide (no need to make a dimple this time).

While we've got everything clamped down, let's make another hole just incase we need something farther out some day.

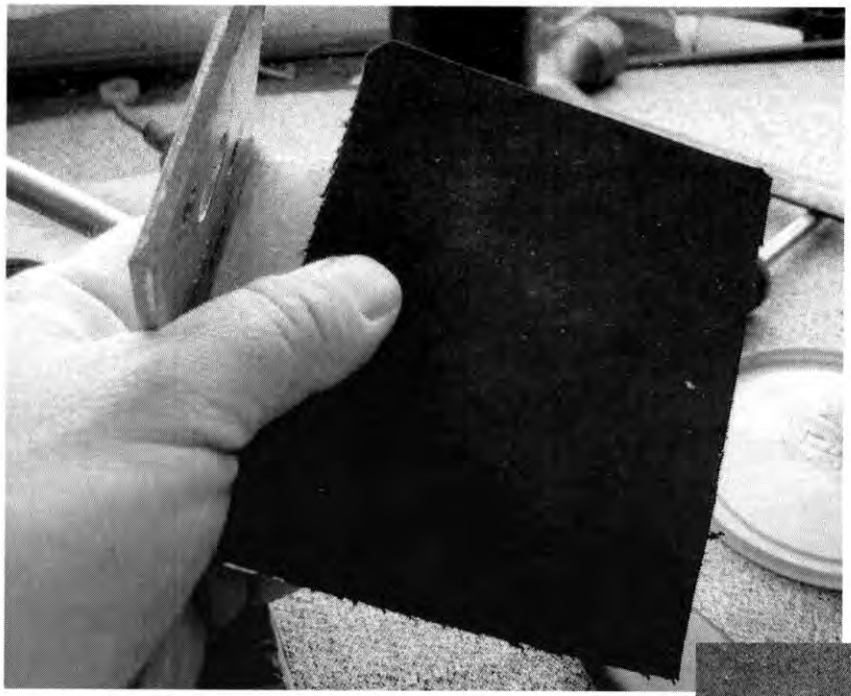
Make a dimple about 3/4" out from the hole you just drilled. Oil up the dimple and drill another camera hole.





Oooh, look how pretty!

Ok, let's put a little pad on there.

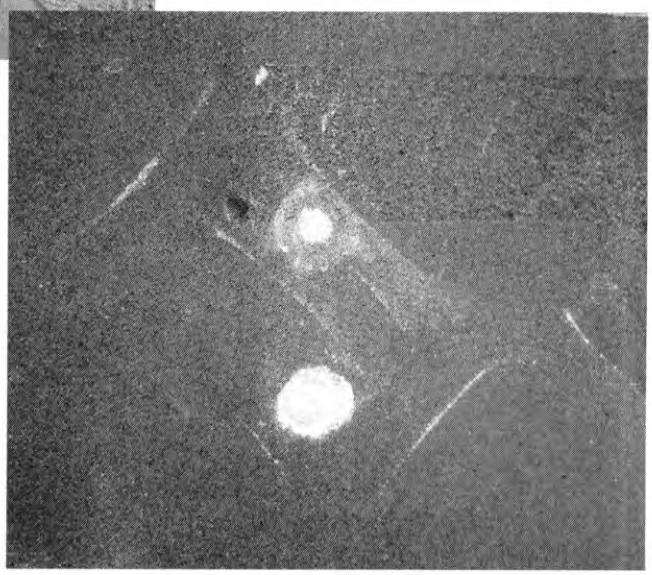


I'm going to use an old mouse pad.

Cut it to the size of your base plate.

Hold it on to your plate, flip the whole thing over...

...and mark the under-side through the holes you just drilled. I'm marking mine with chalk. It makes it super visible.

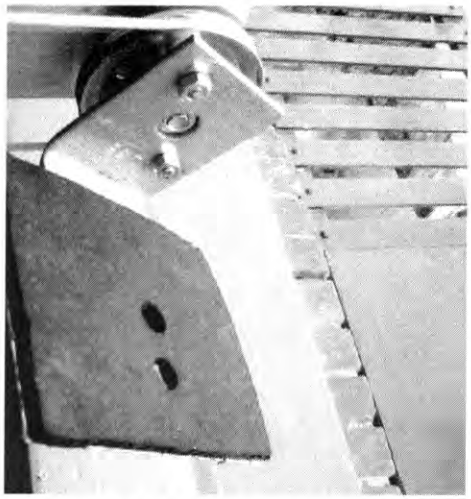


Cut holes on your marks. You can use a knife, razor, whatever. I'm using a cut punch that comes with Grommet kits for cutting round holes in fabric.



Glue the pad onto the plate. I'm going to use an epoxy. It seems to work best for gluing metal and rubber together. But feel free to experiment.





Attach the bracket back on to the tilt wheel on your crane, and you're good to go.

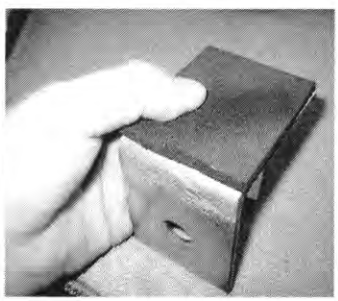
Here's a good thing to do on both your crane camera brackets.

You may have noticed that these big L-Brackets have a big hole. It's a simple matter to slip a washer on the camera bolt before you attach the camera. But that can be a hassle, especially if you lose it on location.

To solve that little problem, I'm simply going to JB-Weld a fender washer over the bottom side of the large hole. And Voila! A small hole. You can also leave the camera bolt in the hole by attaching a retaining ring on the camera side of the hole. I'm also adding an old mouse pad to cushion the camera, but that's not totally necessary.



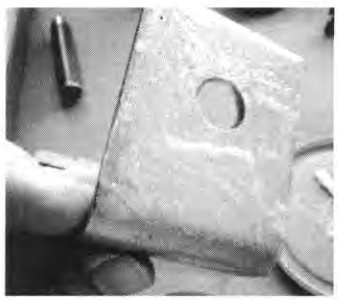
Roughen up the bracket and fender washer.



Cut a mouse pad to size.



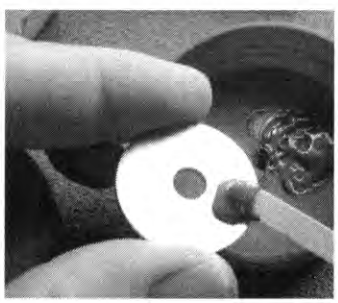
Cut a hole in the pad matching the hole on the bracket. I'm using a grommet punch.



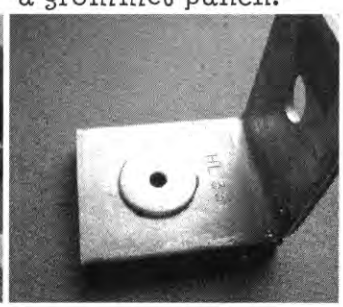
Spread epoxy on the bracket.



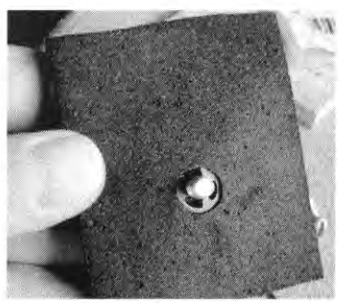
Stick the pad on. Make sure the holes line up.



Mix up some JB Weld and coat the entire surface of the washer.



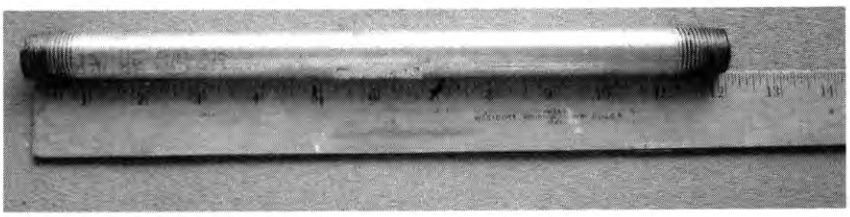
Press it over the hole on the bracket and let dry 24 hours.



Put the camera bolt up through the hole and add a retaining ring. That's it!

Here's another good tip on dealing with those crane weights

These babies are a drag to haul around, but haul them you must. Here's a cheap and easy "Weight Hauler". You don't even need any tools!



A 12" long, 1/2" diameter plumbers pipe threaded at both ends.



A 1/2" floor flange.



A 1/2" T fitting.



Screw the floor flange tightly to one end of the pipe.



Set it upright, and stack your weights on the pipe.



Twist the "T" fitting on top...



...and you're good to go.

WORKING WITH A CRANE

What I'm about to tell you is common sense. Unfortunately, for some strange reason, people lose their common sense on a film set. I see it time and time again. I think the government is experimenting on Hollywood. It's the only logical explanation. So here are a few rules to use ALWAYS.

1. Keep your tripod legs at the widest possible spread. Of course you'll have to balance safety and the needs of the shot.

2. Always weigh down the tripod legs-- sandbags are perfect.

3. Make sure the tripod is level before you attach the crane.

4. Make sure the camera end is setting on the ground and weighted before adding or removing (especially removing!) weights.

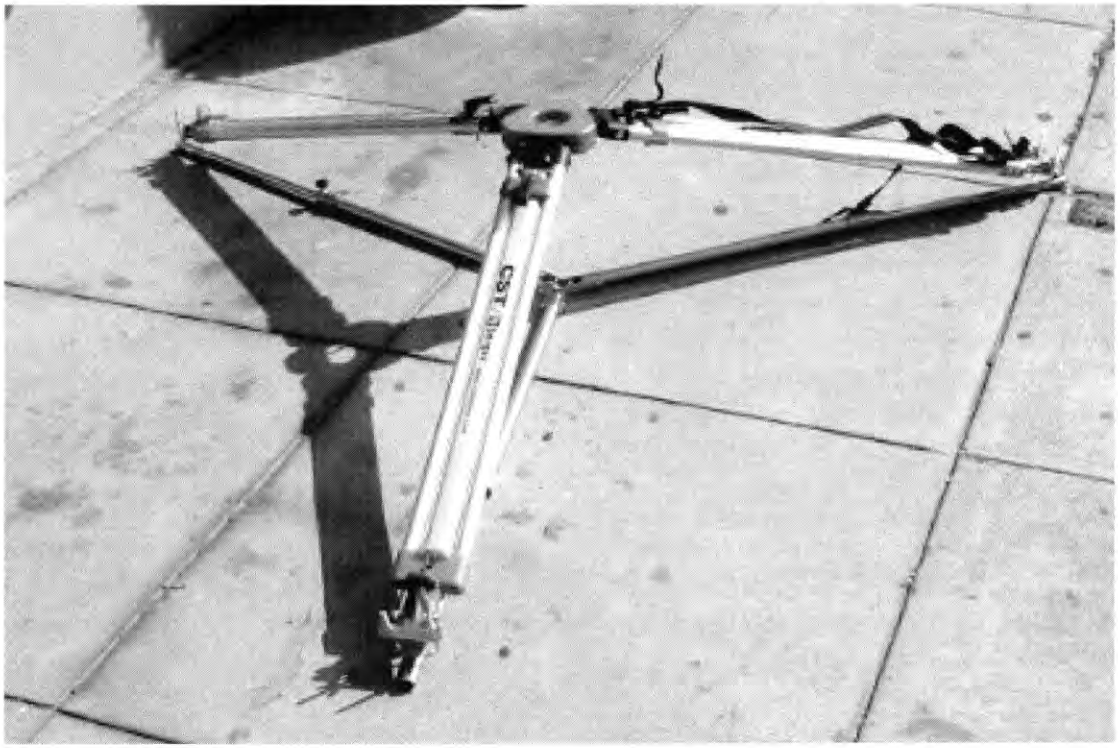
5. When blocking the shot, take the crane through its movements slowly and look for any potential hazard. I've seen the weight end of a crane crash through a window, and the camera end bonk an actor.

6. Cranes do take practice. Not nearly as much as the Stabilizer, but I'd really recommend trying some moves before the shoot day.

There ya' have it. Of course you can always ask a question at:

www.dvcamerarigs.com

THE THIRD MAN TRIPOD



Oh, sure, it looks like a light weight surveyor's tripod, but it is so much more. In this section, I'm going to show you how to butch this baby up so you can throw a crane on it. (And if you're never going to use a crane, this tripod is plenty heavy duty for DV camera work).

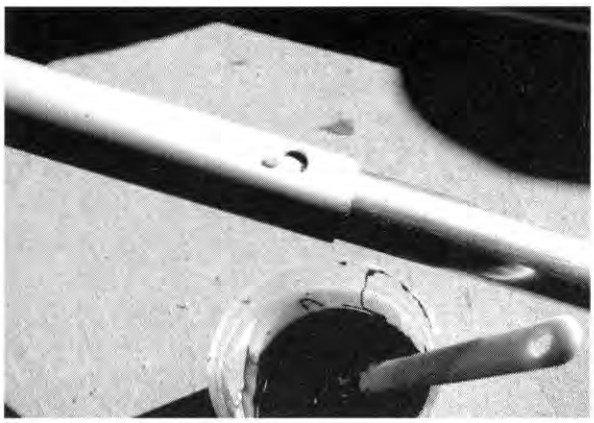
I found this tripod at Lowes for about 80 bucks. It sure beats $500 for a "cinema" tripod, doesn't it?

In the next section we'll be building a tripod spreader for this and any other cinema style tripod.

By the way, when I say "cinema style" tripod, I'm talking about double legs that have the ability to fold all the way out to get the camera as low as possible, as in the picture above. You must use a spreader with this style of tripod!

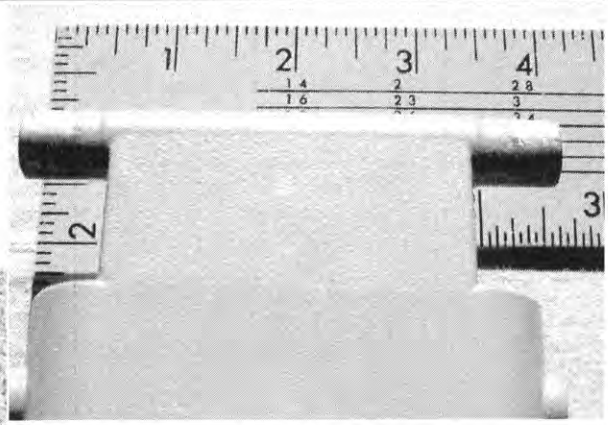
And as always, read through the instructions before heading off the the hardware store because your tripod may be different from mine and you must adjust things accordingly!

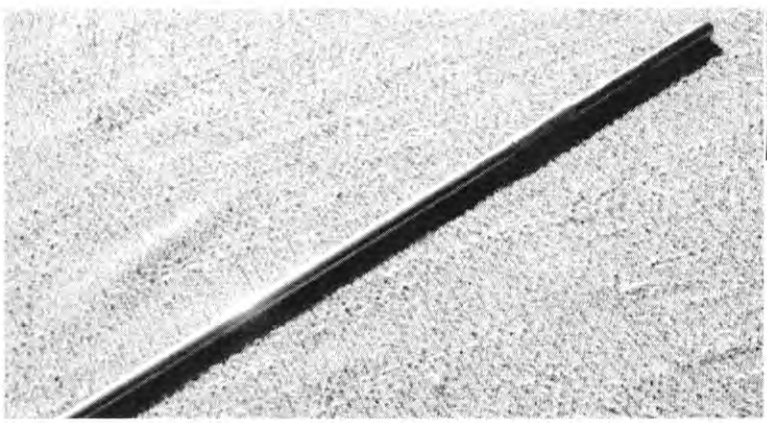
MATERIALS LIST FOR THE THIRD MAN TRIPOD



In the picture above, the original tripod tube (the one with the hole in it) is on the left. The tube going into it on the right, is what you'll be buying.

Once you get the tubes separated from the rest of the leg unit, take one of the tubes to the hardware store or metal supply and find another aluminum tube that will slide right inside the tripod tube. You don't want any wiggle room between the 2 tubes. Measure the length of the tripod tubes to find out how much you'll need in all. And if your tripod is like mine, you'll need enough tubing for six. See page 151.





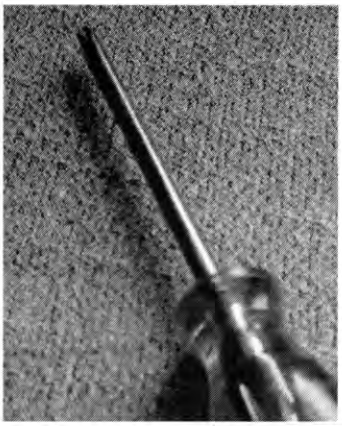
1/4" diameter steel rod.
To figure out how much steel rod you'll need, measure the length of the top of the leg assembly. This one measures 4". Since there are three of these, I'll need 12" of steel rod.



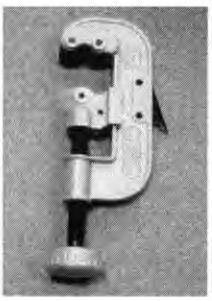
(2) J-B Weld.

You'll need two packages for this project.

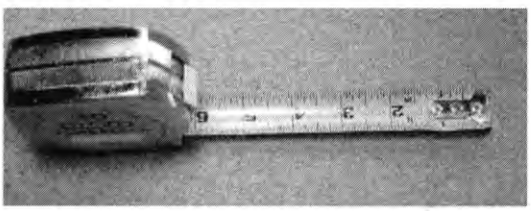
TOOLS LIST FOR THE THIRD MAN TRIPOD



A screw driver. My surveyor's tripod has phillips head screws. Yours probably does too.



Pipe Cutter. Like the vise, think ahead to future projects. For this project, you can get by with a smaller one. But if you plan on making the Stabilizer, for example, make sure you get one that can open wide enough to go around a 1 1/4" diameter pipe.



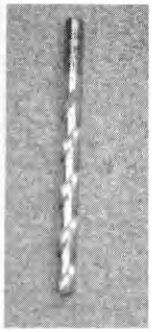
Tape measure



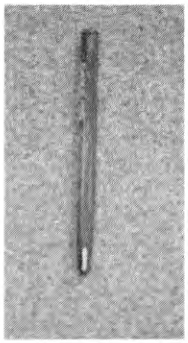
Vise. For this job, you can get by with 3 or 4 good clamps. But if you're going to build anything else in this book, go get a vise. I found this one at OSH for $9.95, so the investment is minimal. Mount it on your bench or a heavy piece of plywood.



A hammer.



1/4" drill bit.
1/8" drill bit.



A center punch. This puts a dimple in metal to keep your drill bit from "walking". VERY IMPORTANT!



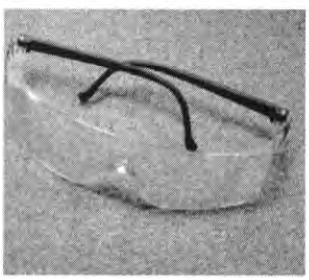
A drill.



Drill cutting oil.



A hacksaw.



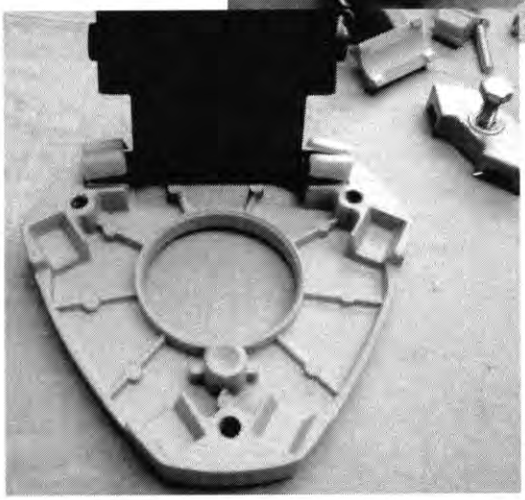
safety glasses.

LET'S BUILD IT

1.



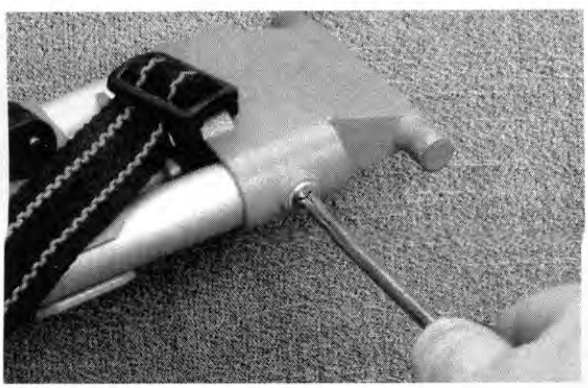
First, remove the leg units from the head of the tripod. And while you're at it, lose that knob with the treads on it. **Hold on to that paper clip looking thing though!**



This is the head of mine with 2 of the leg sets removed. (I painted the top part of the leg set black so you could see it a little.

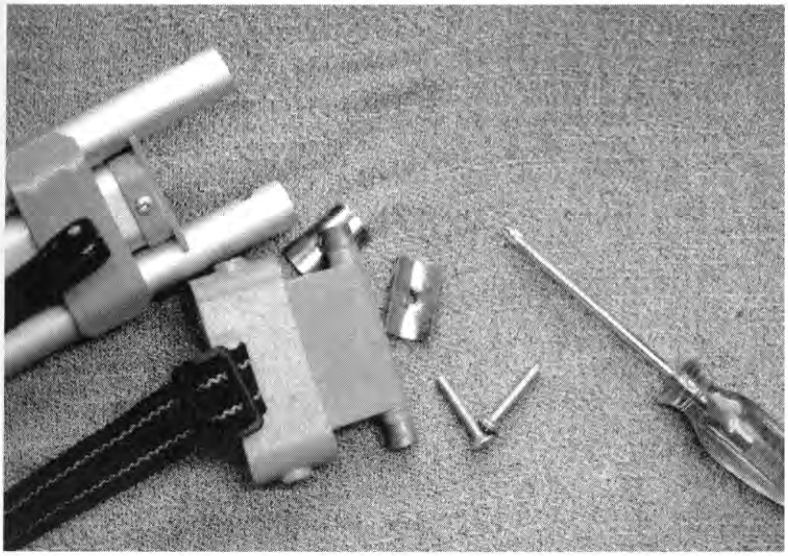


Your leg set will look a little something like this once you've taken it off the head.



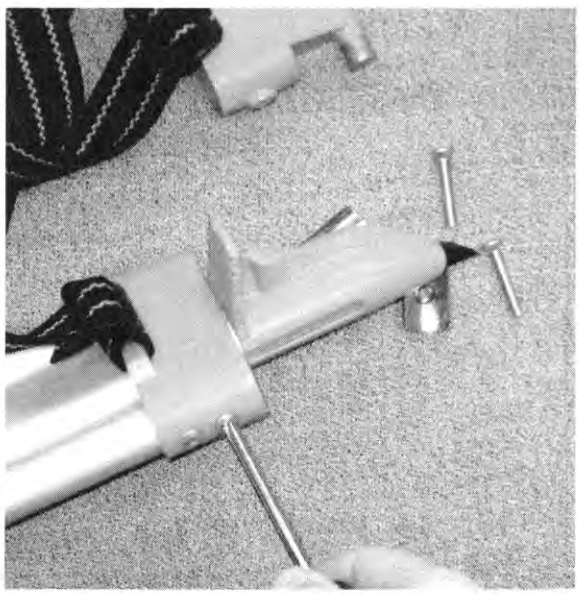
2.

Take a screw driver and remove the screws that hold the legs to the top.



Make sure you keep track of all the little pieces and where they came from. I threw all of mine in a big bowl.

3.



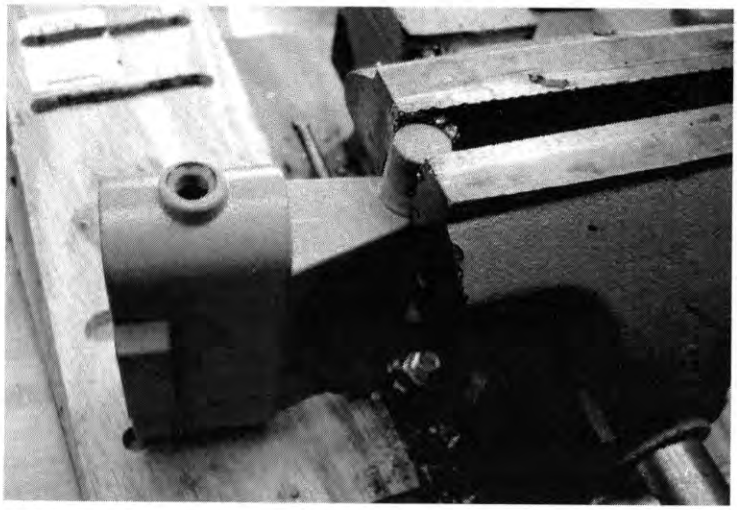
Now take off the feet. Repeat the steps on the other 2 legs.



Remove the tubes that are on either side of the center leg column.

These are the tubes you'll want to take to the hardware store to find a good match to slide inside.

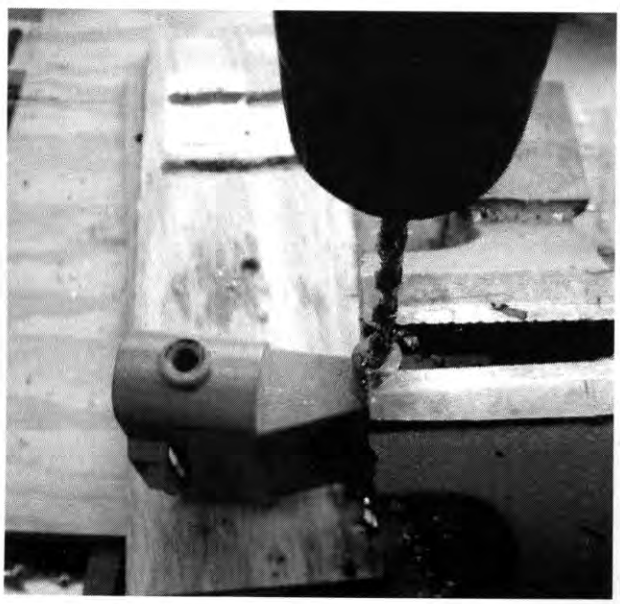
4.



Take the top unit that held the legs and clamp it in to your vise as shown. Make sure it is vertically straight. I've also put some scrap wood under the bottom part to support the piece so it doesn't move around, because we're going to drill in to it.

Take your center punch and place in the middle of the piece in the vise. (I just eye-balled it), and give it a good thwack with the hammer to make a dimple. You HAVE to do this. It is critical that your drill not drift from the center. I'm using a 1/4" bit. Yours will depend on your tripod and rod size.





Put some cutting oil on the dimple and drill straight down. Make sure your bit travels straight! This is also why it is important to take your time putting this piece in to the vice, making sure it is straight.



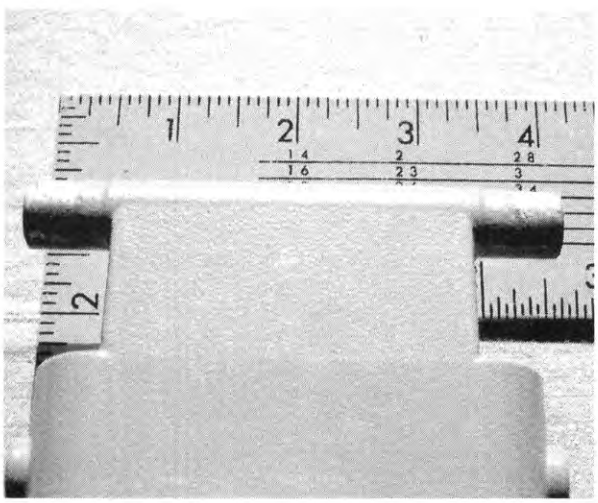
This is a view of the inside as I drill down through. I'm going all the way through the little support piece in the center (see the little shelf with all the metal shavings on it?)

There she is. Next flip the unit over, and drill through the other side.

Then do the same on the remaining 2 units.



5.

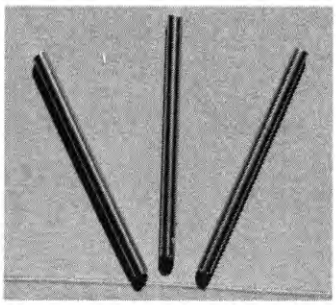


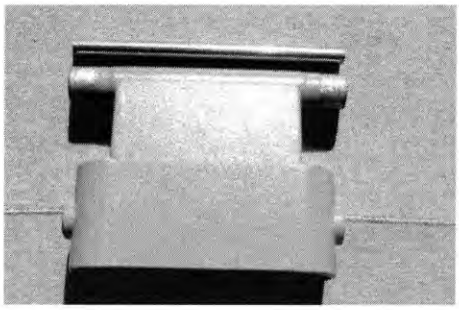
Measure the width of the part you just drilled through. In this case, 4 inches.

This is how long the steel rod needs to be for each piece.



Clamp the rod in the vice, and cut 3 four inch lengths with your hacksaw.





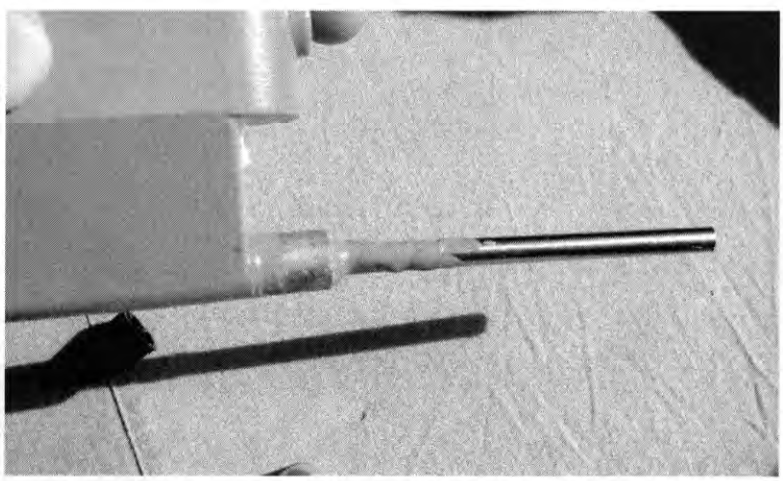
Before the next step, make sure that the rods and the tripod part are super clean of all oil and metal chips on all three tripod sections. Acetone works great for this, but I've used a grease cutting dish washing soap and hot water with good success. Make sure the pieces are dry, then...

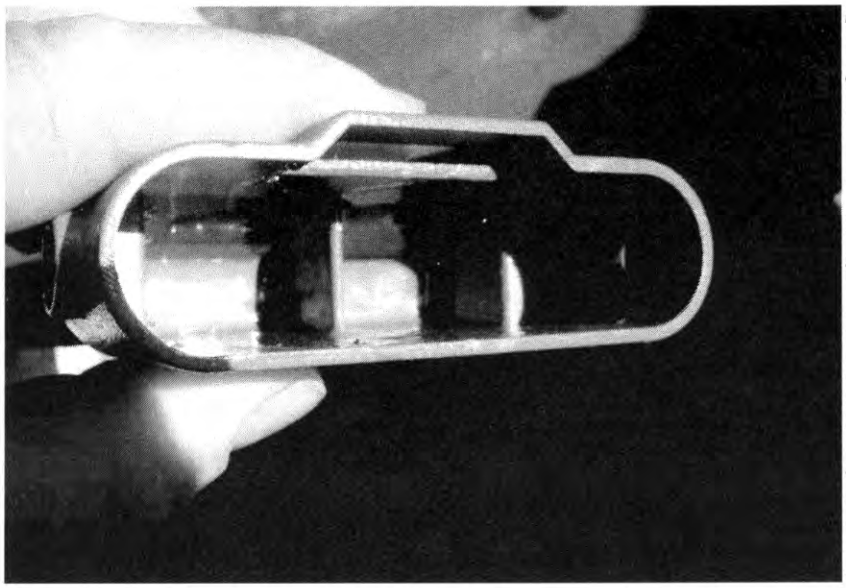
6.



Mix the ENTIRE tubes of J-B Weld together.

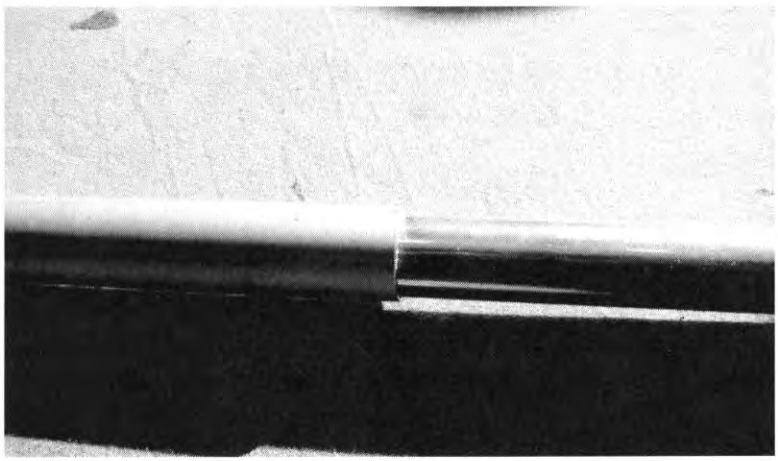
Take a steel rod section, and coat it with the J-B weld. Shove it into the hole you drilled all the way through to the other side. You may have to tap it in with a hammer. Do this to the other two.



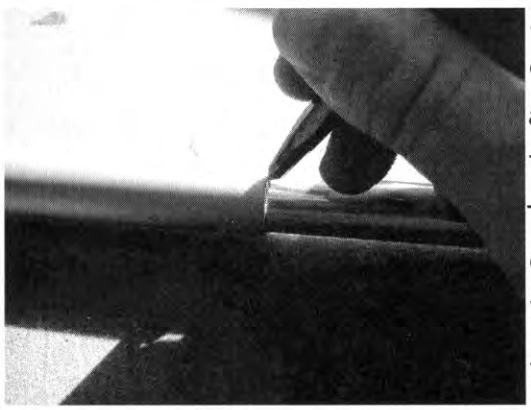


This is why you needed the whole tube of J-B Weld: You want to completely cover the steel rod inside the tripod piece. This is not the time to be cheap with the Weld. If you need to mix another tube, do it! Finish up the other 2 like this. And set them aside to dry for at least 24 hours.

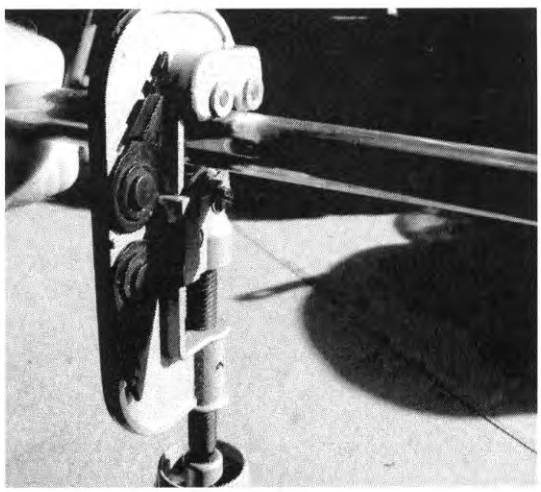
7.



Next, take the tube you took off the tripod, and slide the aluminum tube from the supply shop inside all the way, so that the ends match up.



Mark the top of the tube, and trim off the excess with the tube cutter. You'll need to make six of these.



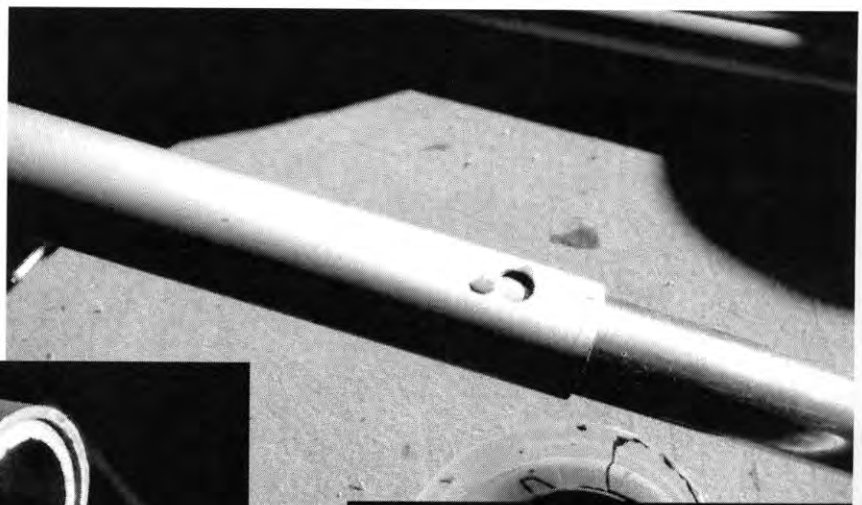
8.



Mix up another batch of J-B Weld. (And no, I'm not being paid by the JB people. Not yet anyway!)

Take a long stick of some sort (I'm using a little spatula) and glop some Weld down in the tripod tube from the top to about 6" in or so. Make sure to get it on all sides as best you can. Do this on both ends of the tube.

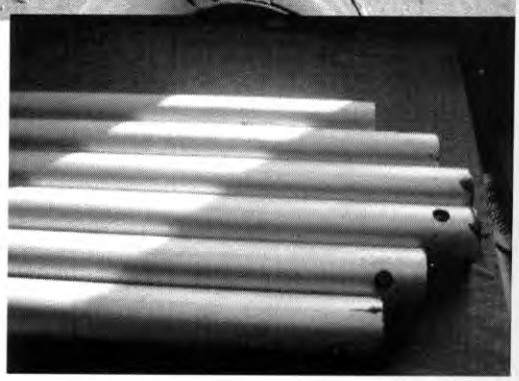
Slide your cut tube all the in, rotating it at the same time to coat the J-B Weld as much as you can on the inside.



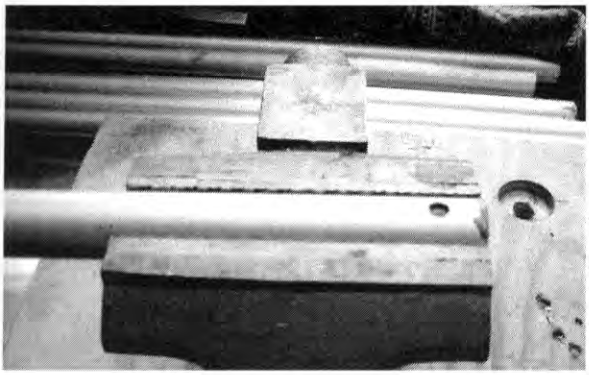


Set the tube aside and do the other 5.

Let them dry 24 hours before moving on.



9.

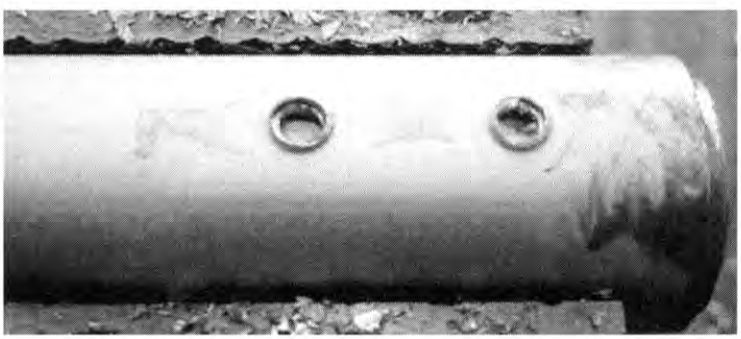


OK, here's the thing: the tripod legs that you modified yesterday (You DID let them dry 24 hours, RIGHT!?) have holes in them for the screws that hold the whole tripod together. But we, in essence, put a core in those legs. So now we have to drill holes in the core that match the exsisting holes from the manufacturer. I can't tell you what size drill bit to use, because I don't know what tripod you're working with. So take a few bits, and place the end in the hole to try and find a match. A little smaller is ok, a little BIGGER IS NOT!

Once you've determined the size of drill bit you need, add some oil and drill away.



The holes on my tripod don't go all of the way through, so I only need to drill a hole in one side of my core.

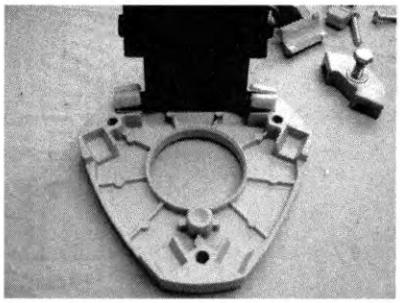
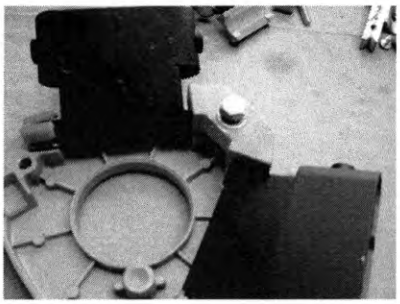
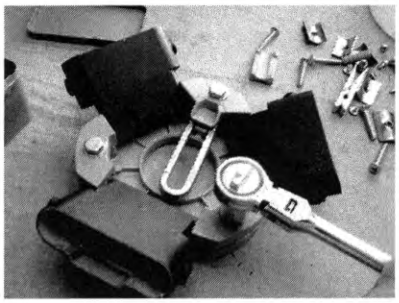
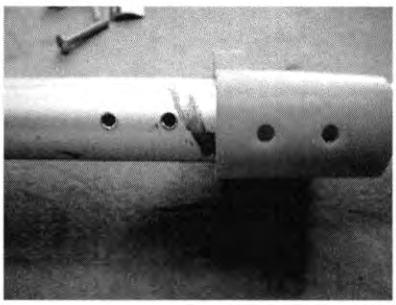
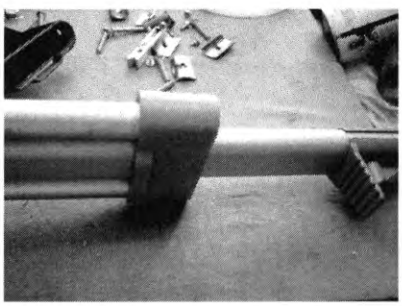
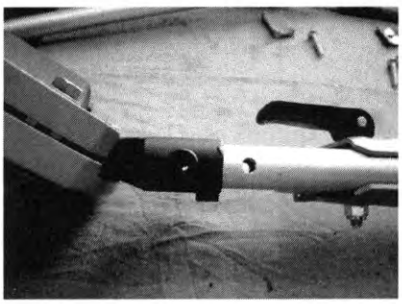


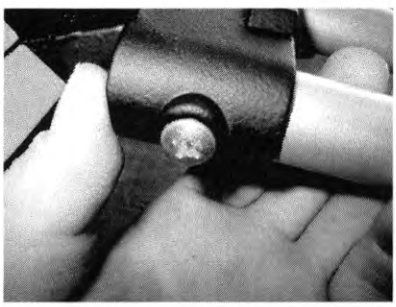
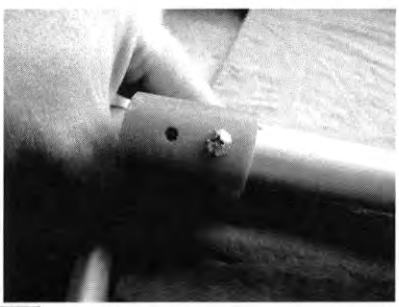
On the bottom of the manufacture's tube are these two little holes. I'm going to find a drill bit to match, and drill these out as well.

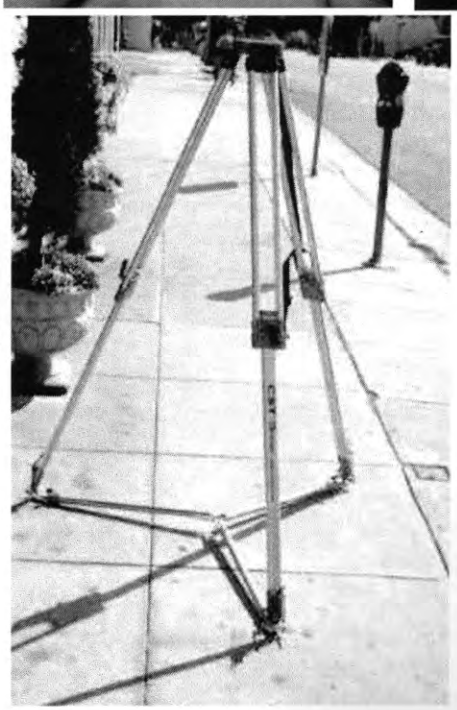
Do this on all your tubes, and it's down hill from here!

10.

Put the whole tripod back together. I hope you were paying attention when you took it apart!

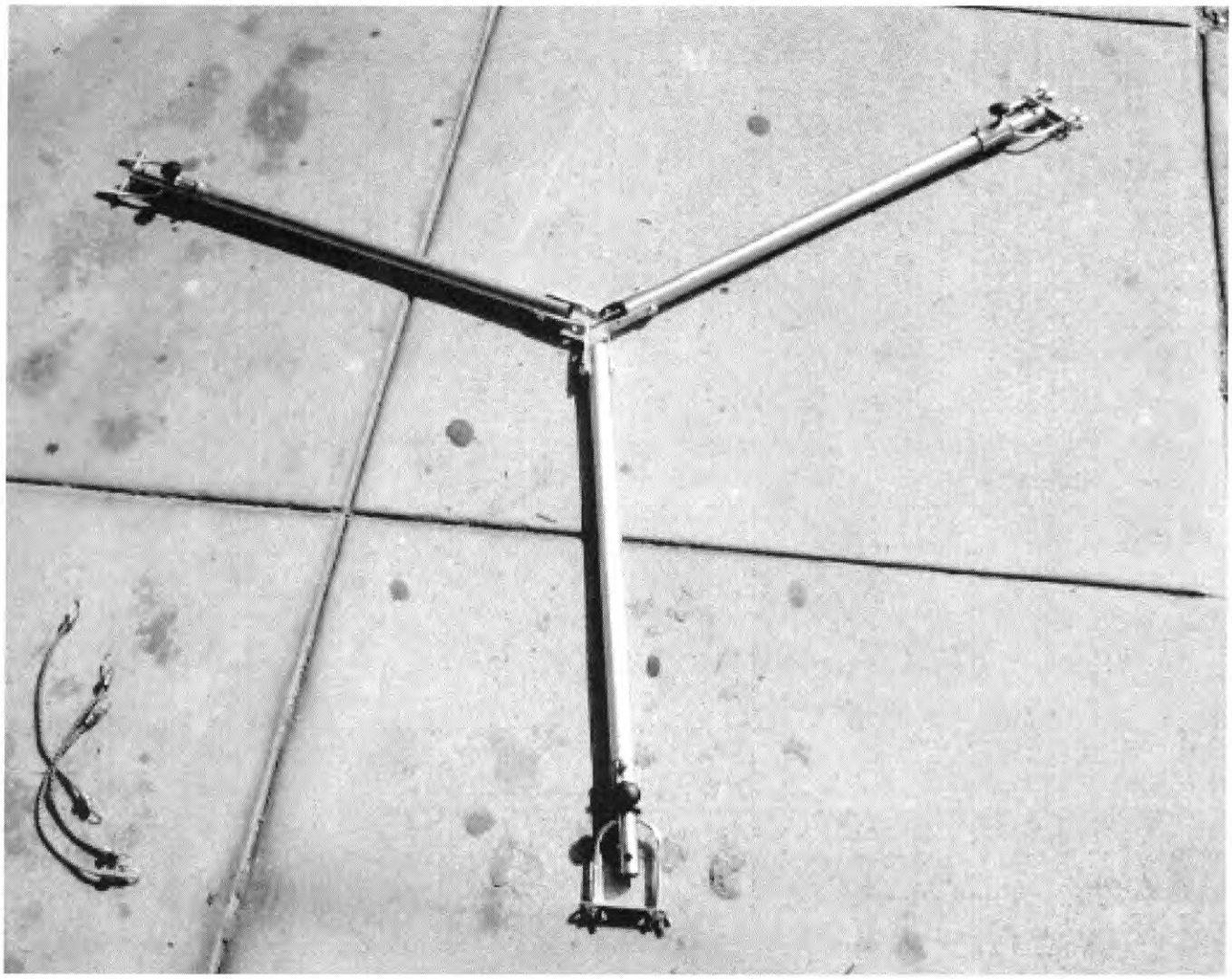









OK, let's move on to the spreader. This rig is a piece of cake to build.

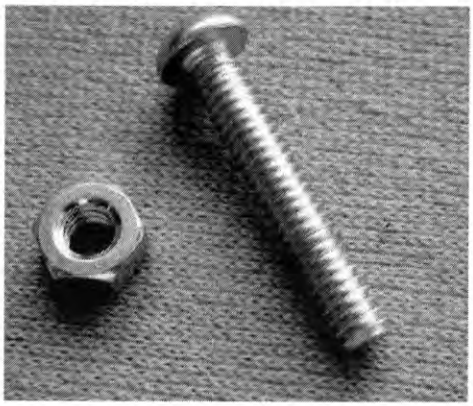
THE STEEL TRAP SPREADER



What the heck is a spreader, anyway? Basically, a spreader keeps the tripods feet where you want them, and strengthening the whole she-bang in the process.

If you were going to buy a spreader it would run you anywhere from 50-350 bucks. You can make this one for less than $25. This spreader is designed for any tripod with spike feet, and is a perfect, if not necessary, companion to The Third Man Tripod.

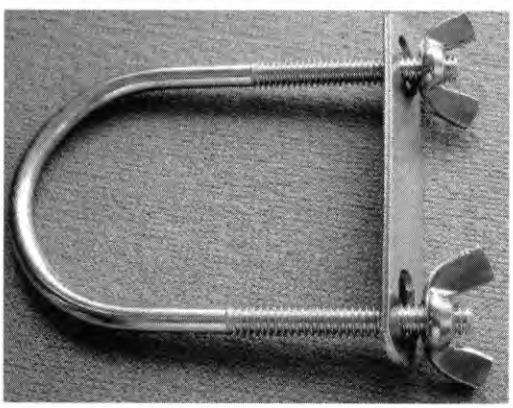
Materials List for the Steel Trap Spreader



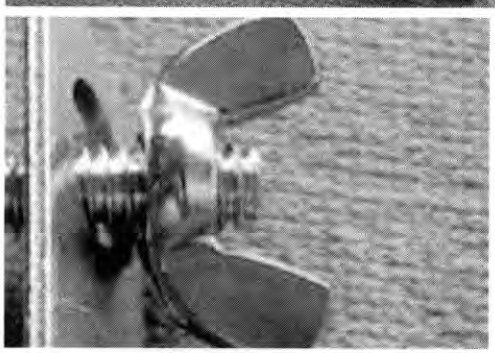
(3) Nuts and bolts. 1/4" x 1 1/2 inches long.



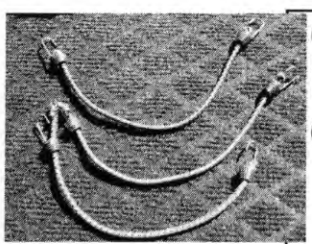
(3) L-Brackets. The length of one side of the "L" should be 2 1/2" long.



(3) U-bolts. 1/4" x 3" or longer. If you can find 1/4" u-bolts that run 6" even better. (I couldn't find 'em anywhere). Also, I've replaced the nuts that came with the bolt with wing nuts.



(6) 1/4" wing nuts.



(3) mini Bungee Cords.

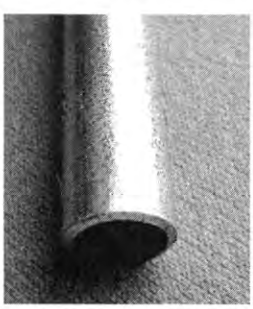


(3) Knobs. You don't HAVE to have these, but it makes setting up your spreader much easier. The threads must be able to screw into the conduit coupling (next on the list), and long enough to reach the 1/2 conduit that slides inside the coupling. Take a look at the picture below on the right. A half inch long thread will do it. ☐





(3) 3/4" Conduit couplings. Go the electrical section and pick this up before the above knob. This has 2 set screws in the top. Take one out and try screwing different size knobs or bolts until you find the correct for the set screw hole. ☐



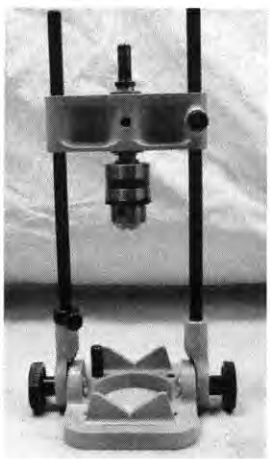


Electrical conduit.
This comes in 8' lengths or longer. 8 feet is plenty. You need:
(1) 3/4" ☐
(1) 1/2" ☐

Tools List for the Steel Trap Spreader



Pipe Cutter. As I mentioned on the tripod plans, on this project you can get by with a smaller one. But if you plan on making the Stabilizer, for example, make sure you get one that can open wide enough to go around a 1 1/4" diameter pipe.



If you don't have a drill press, I really encourage you to get one of these. It's a handy drill guide, and will keep your holes straight and true--very important in this type of work. It also has a V in its base to hold a round piece of pipe for perfect center drilling (something we do alot around here.) It runs about $35 bucks. A good investment if you build more than one project in this book. ☐



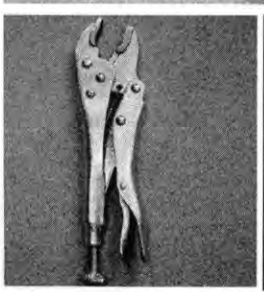
A drill. ☐



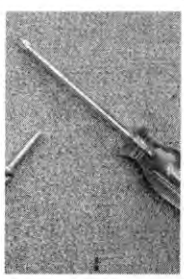
Drill Bits. ☐

1/4" bit

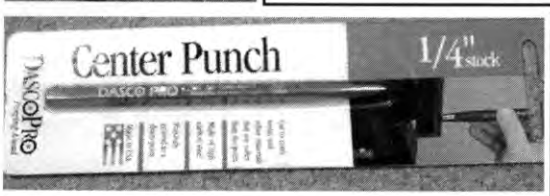
5/16" bit ☐



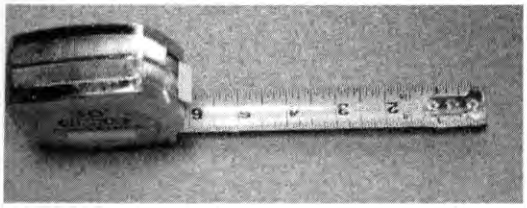
Vice grips, pliers, wrench...any 'ol thing that will grab a nut. ☐



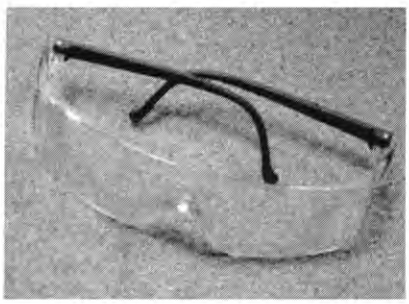
A screw driver. ☐



A center punch.
This puts a dimple in metal so your drill bit doesn't walk. ☐



A tape measure.

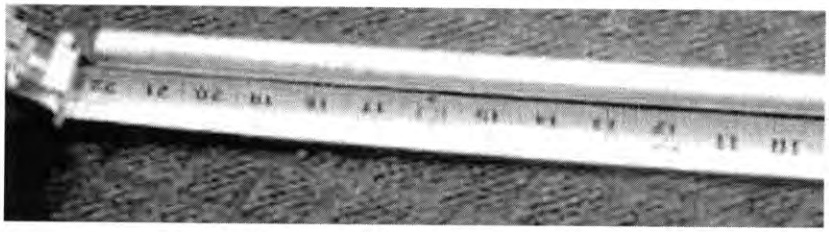


Safety glasses. Use these whenever you cut or drill. Especially when cutting or drilling metal!

A felt tip marker. You don't really need a picture of a felt tip marker do you?

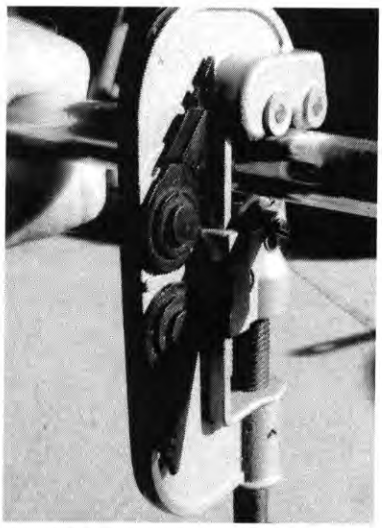
Let's Build It!

1.



Take that long piece of 3/4" electrical conduit and measure off 22".

Take the pipe cutter and cut it at the 22" mark. Measure off and cut 2 more 22" pieces.

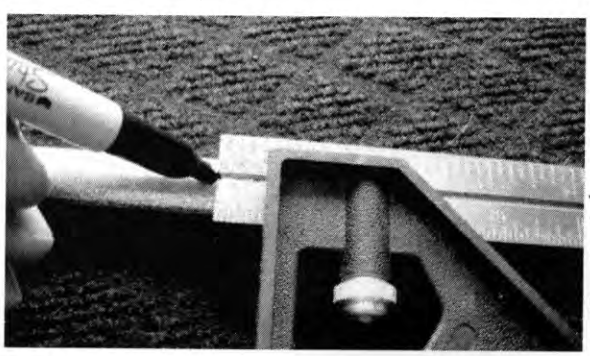


2.



Now take your 1/2" pipe and cut three 22" pieces.

3.

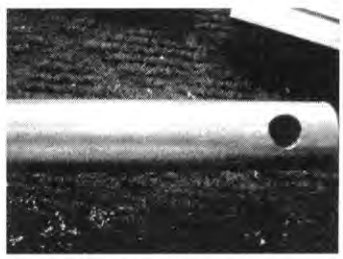


On the three 1/2" pieces of conduit, measure in a 1/2" from the end and make a mark. Then take your center punch and carefully make a dimple on the marks.

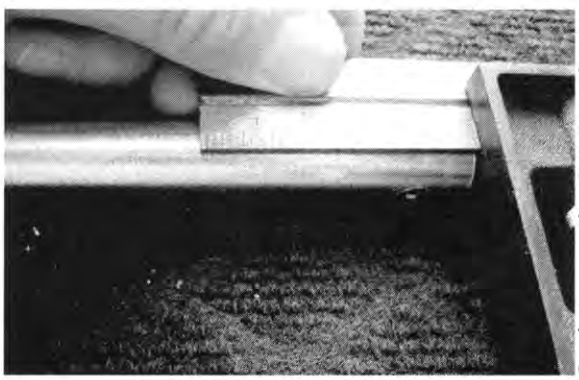


4.

I truly hope you took my advice and bought this little drill jig. It makes life very easy when cutting round things. Put a 5/16" drill bit in. Line up the dimple on your tube at the tip of the drill bit. See how the tube rests in the "V" on the drill jig? I'm also using a bit of scrap lumber (It's under my hand) to support the long end of the conduit. When drilling in metal like this, go about half the speed as you would through wood. Also, just get the hole started, then put some drilling oil in the hole. Add more oil if you have to as you drill. The idea is to keep the bit wet. Once you've got this one done, do the other 2.

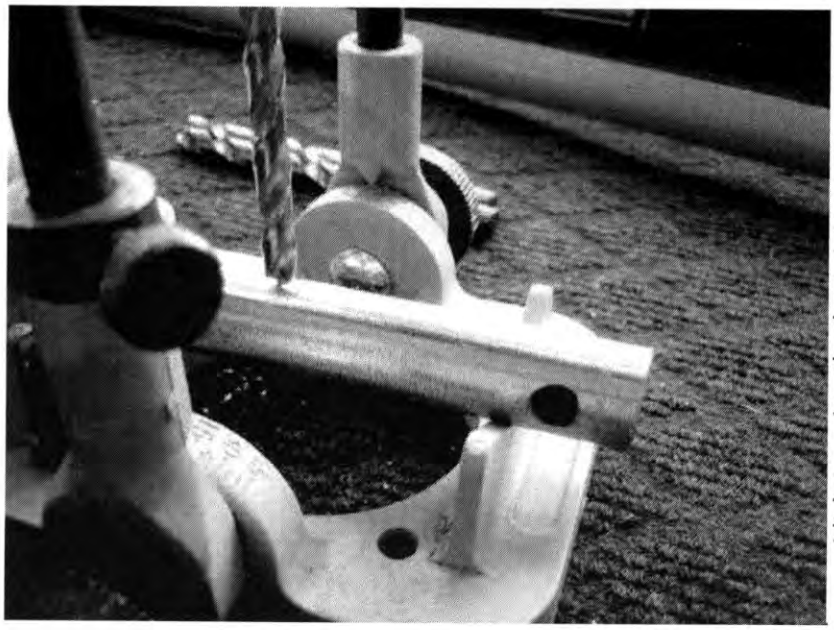


DO NOT DRILL THROUGH BOTH SIDES OF THE TUBE! JUST DRILL THROUGH THE TOP AND STOP!



OK, read this carefully. Set the tube with the hole you just drilled on your work bench. Adjust the conduit tube until the hole is on top (facing the ceiling).

Now, carefully roll the tube a quarter turn until the hole is on the side of the tube. Next measure down 2 inches on the top of the tube and make a mark. We'll be drilling straight through the tube on this mark, so go ahead and make your dimple with the center punch. Take a look at the next photo to clairify things.



Load a 1/4" bit into the drill.

Take a look at this photo. See the larger hole on the side? And now we're going to drill through the top. This time go through both sides of the conduit.

Do this on the remaining 2 pieces.

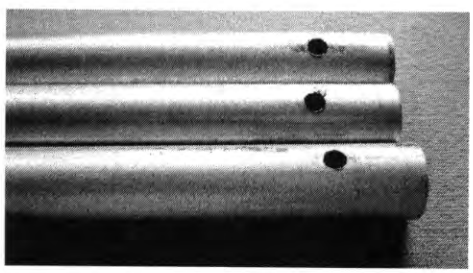
5.

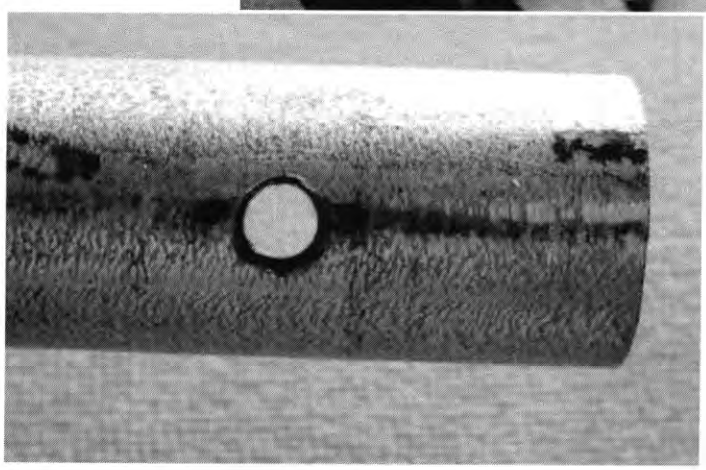
Leave the 1/4" bit in the drill.

Take your 3/4" conduit pieces. Measure 1" from the end and put a mark, then pound a on that mark like we did on the 1/2" conduit.



Again, using the 1/4" bit, drill down through both sides of the pipe on all three.





6.

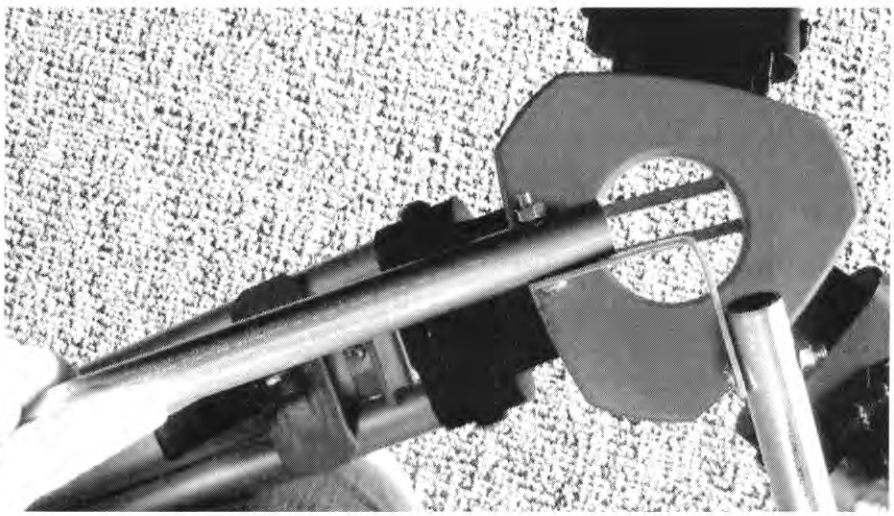
Grab your 3 "L" brackets and nuts and bolts.



Use the nuts and bolts to attach the L-Bracket to the 3/4" conduit. Use the outside holes on the L-Bracket. Tighten these babies tight.

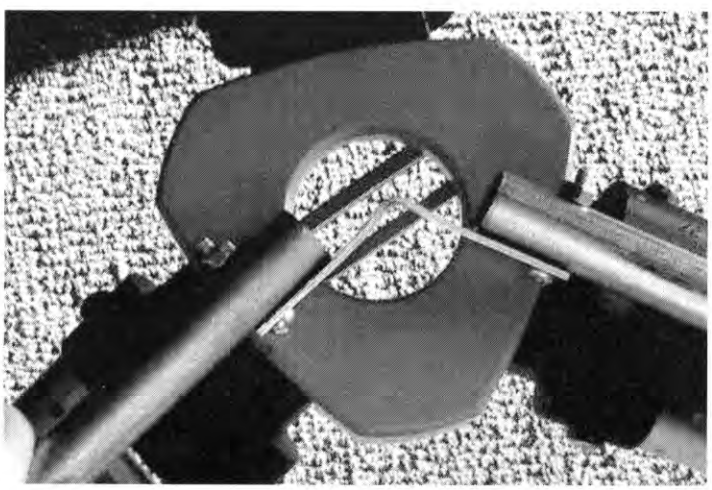
Set up your tripod. We'll be using it for reference.

Now we're going to bend the L-Bracket so the angle of the conduit matches the angle on the tripod legs.

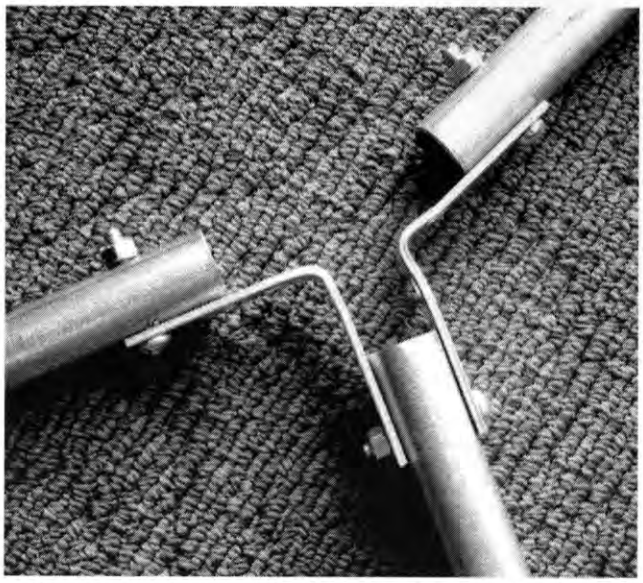


Grab one piece of conduit in your left hand and one in your right.

Line up one of the pipes over a tripod leg, and bend the two outward until they match the same angle as the legs. Because the pipe gives you plenty of torque, that L-bracket will bend like butter.



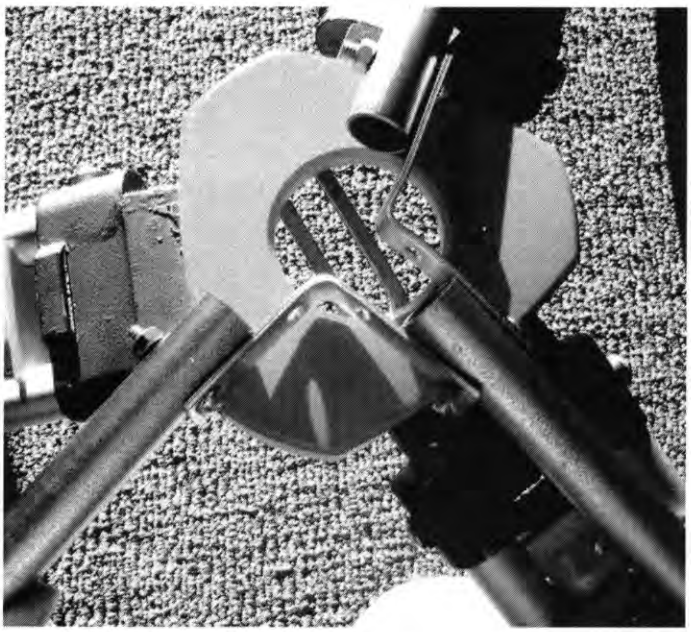
See how they match the legs now?

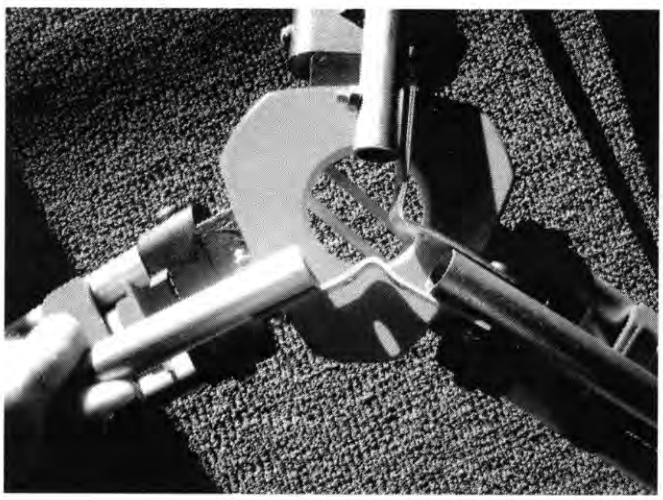


Leave the first L-Bracket on, and attach a second bracket to one of the pieces of conduit that holds the now bent bracket. Then attach the third pipe to the unbent bracket.

Just take a look at the picture.

Line the 2 pieces of conduit over the tripod legs, and bend the third piece until it is over the third leg.

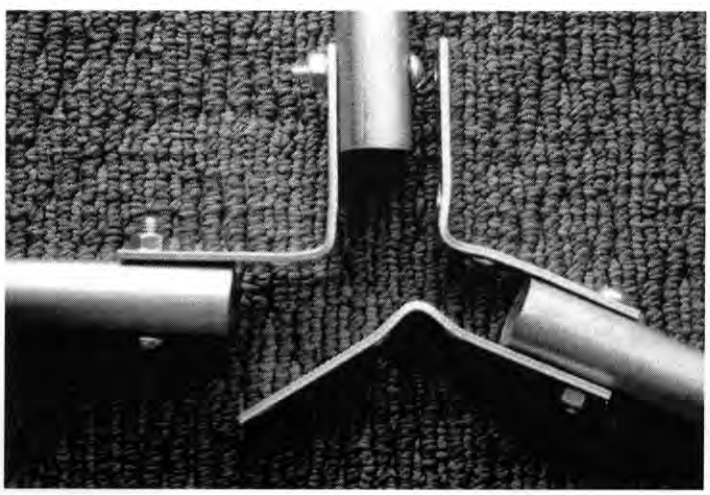


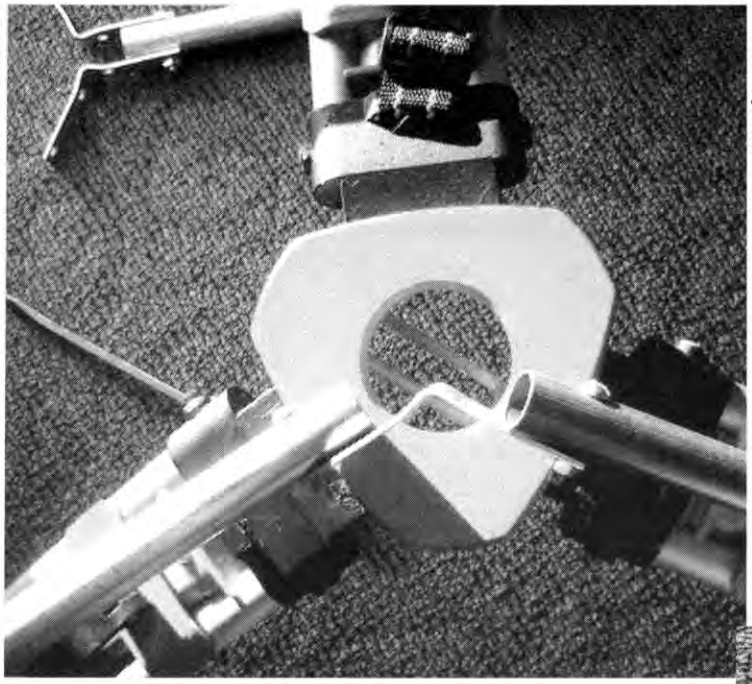


See, piece of cake.

Next, unattach the pipe from the bent L-brackets. Then take the 3rd L-bracket and attach it to the pipes you just unattached.

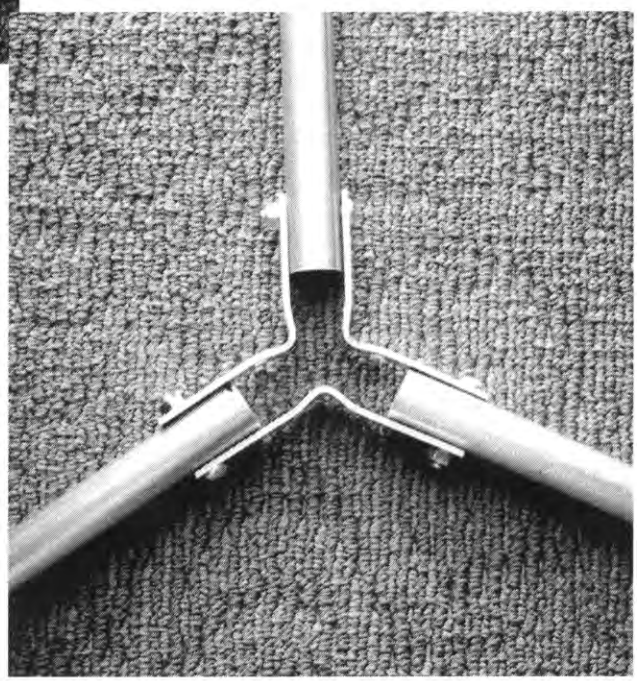
Does that make sense? Yeah, I know, just look at the picture on the right.





Take these last two, and bend away just like you did on the first two.

Now bolt everything together so it looks like the picture on the right.



7.



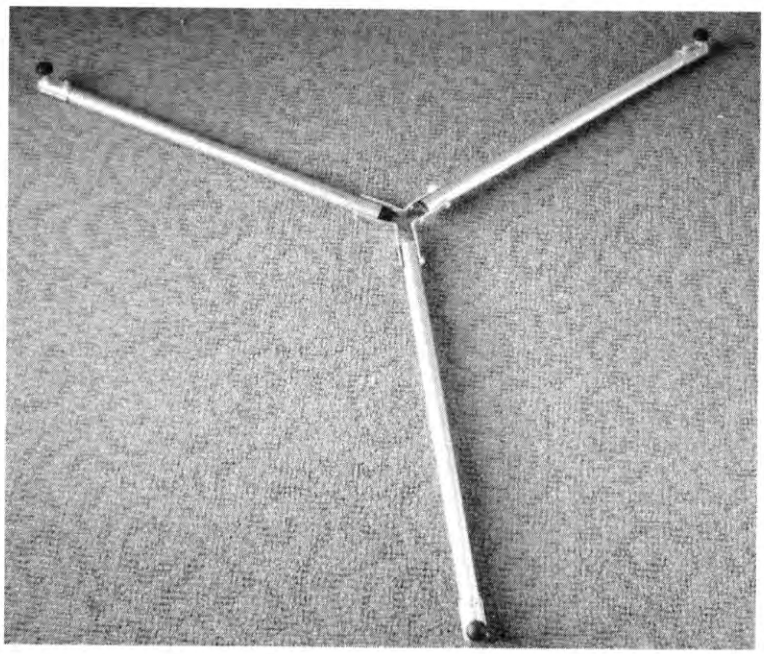
Grab your 3 conduit couplers and remove one of the set screws from each.



Replace the set screw with the screw knob on all three.

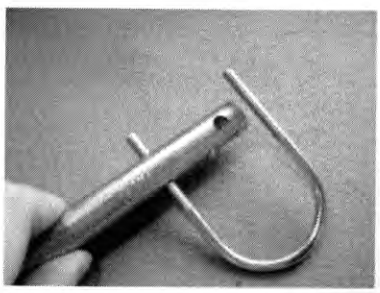
Put the new connector on each 3/4" pipe on your spreader and tighten down the set screw super tight.

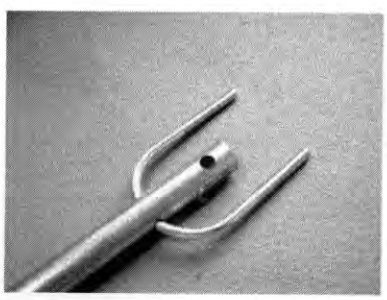


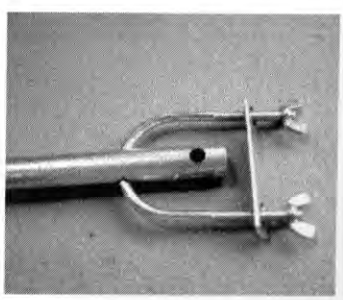


8.

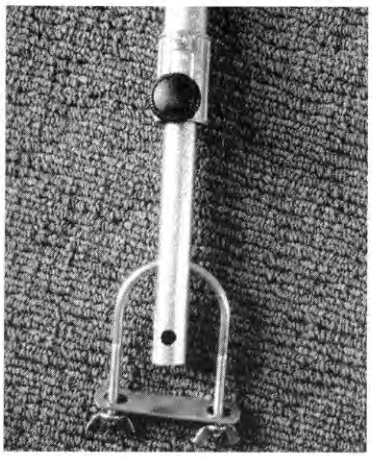
Take the 1/2" conduit and run the U-bolt through the 1/4" hole. Add the u-bolt plate and wing nuts.



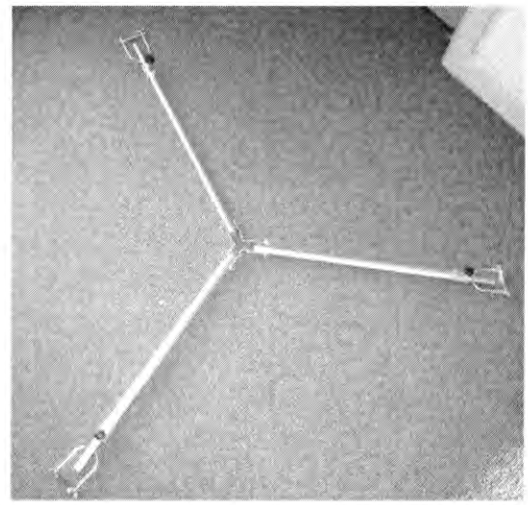




9.



Slide the new 1/2" unit in to the 3/4" spider and tighten down the knob.



It's starting to look like something, isn't it?

For the next step you'll need your tripod. (Remember, this spreader is for tripods with spike feet).

10.

Lay out the spreader on the ground and slip the spike feet into the hole at the end of the spreader.

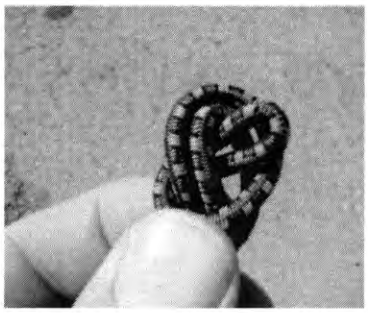




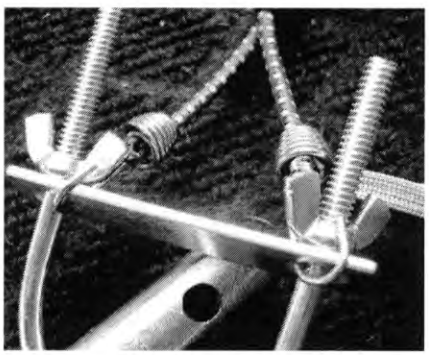
11.

On the three mini bungee cords, you'll need to tie a little loop in the middle to take up the slack you're going to have.

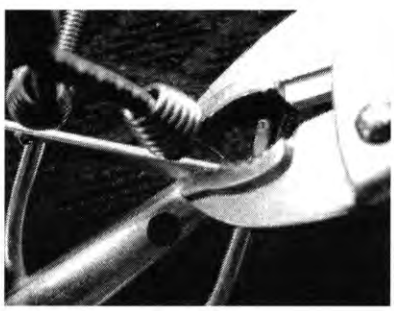
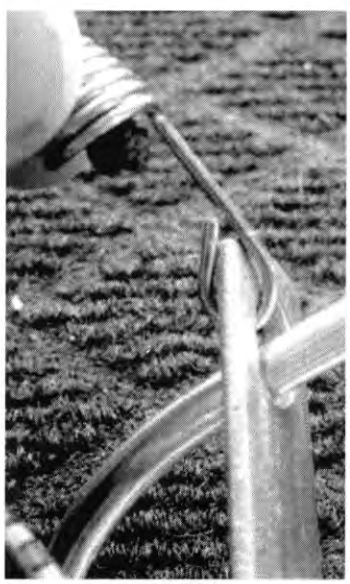





12.



Loop the hook ends of the bungee in to the holes on the u-bolt plate, and squeeze them down with a pair of pliers.

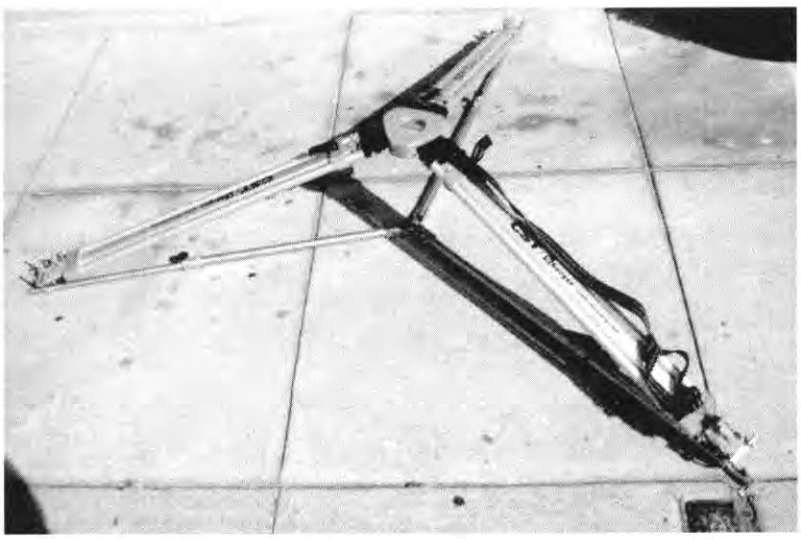


On the tripod base, you'll find a little foot mantel that is used for pushing the tripod into soft ground with your foot. Loop the bungee over this mantel, then tighten down the wing nuts all the way.

Let me confess, that my original idea was to have the plate on the u-bolt tighten against the mantel, and not use a bungee at all. The problem was that any u-bolt I found that was long enough to reach the mantel, also had a huge diameter. So if you can find a 1/4" u-bolt out there that is long enough to reach the mantel, get it! (And drop me a line letting me know where you found it!)

And looky, it folds up when not in use!

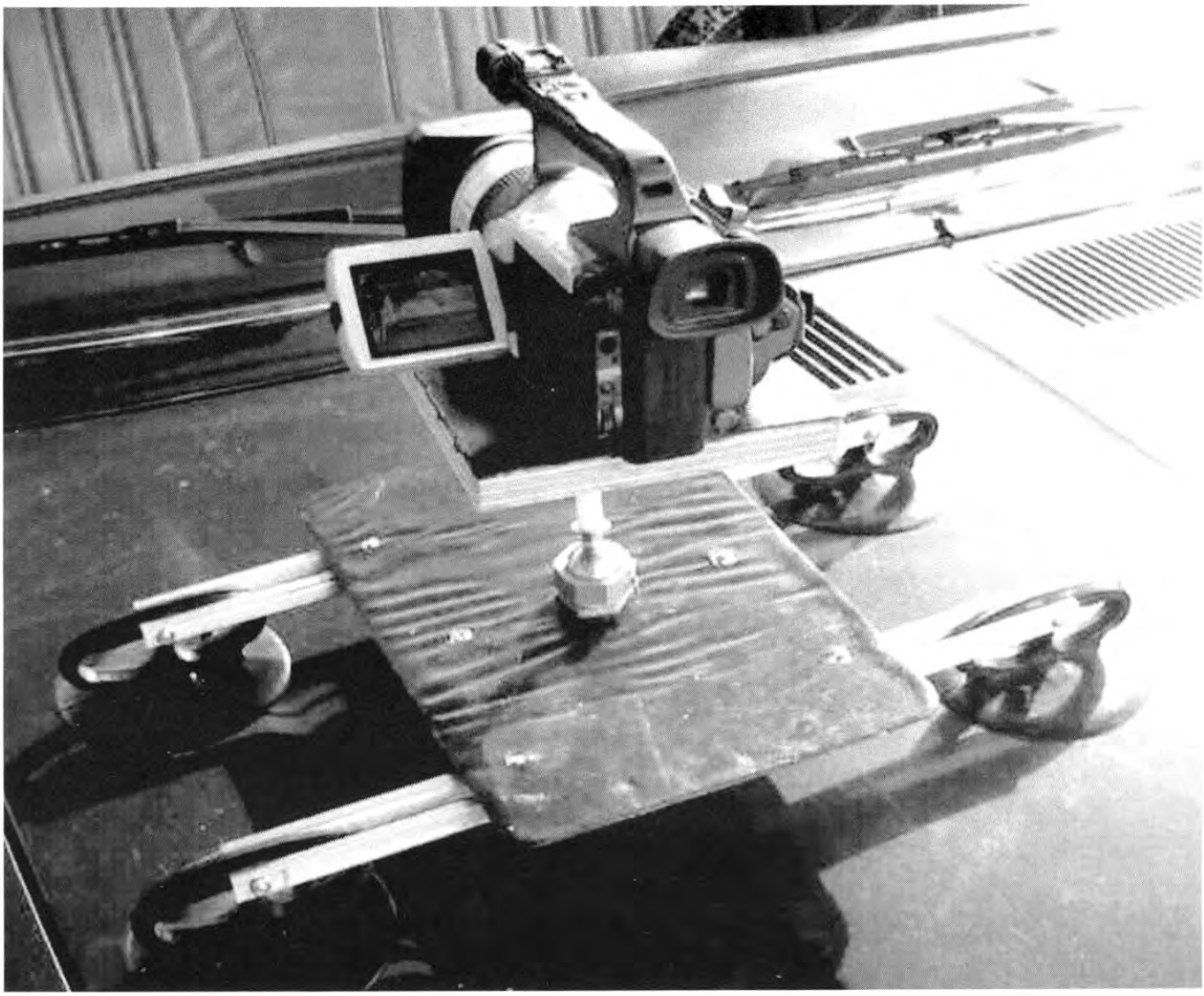




OK, that does it for the Steel Trap Spreader. Its use is pretty straight forward. Simply slide the 1/2" tube in or out to where you want it and tighten down the knob. Remember, the wider the legs, the more stable.

THEY DRIVE BY NIGHT
CAR MOUNT

THEY DRIVE BY NIGHT CAR MOUNT



This car mount works really great. At least it hasn't flown off the hood of my car yet! As you can see, it uses 4 suction cups to keep it where you put it, and uses two ball joints to position the camera platform in just about any configuration.

Please read the "How To Use" section carefully. This rig isn't meant to go travelling down the freeway unless you're in a slow moving traffic jam (which is pretty much all the time now in Los Angeles).

MATERIALS LIST FOR THEY DRIVE BY NIGHT



You'll need four, 4" or larger suction cups. You can find these at bigger automotive shops in the body repair section. You don't need the big expensive ones. These run about 5 bucks each, and are also the easiest to find.



(4) bolts 1 1/4" long x 3/16th, with nuts.



(4) Aluminum bars. Mine are 1/2" tall by 1/4" thick by 18" long. Try to find something close to this.



(1) A standard clip board.



(4) 1/2" Insulating bushing. You might be able to get by with just two, but they're so cheap, you might get 4 to save yourself a trip back to the hardware store. These are in the electrical section.



(2) drawer pulls. Take a look at "Finding the right drawer pulls" on page 196.



(1) Threaded rod. This needs to be able to screw into the drawer pulls above. See page 198.



(1) Nylon spacer. See page 198.



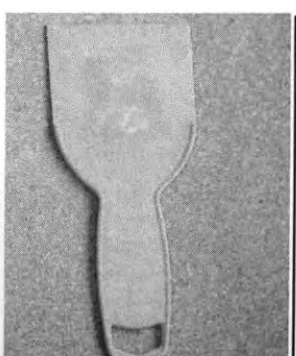
(2) 1" Electrical compression connector for electrical conduit.



(1) 1" Floor flange. The above connector needs to be able to screw into this flange. You'll find the flange in the plumbing department.



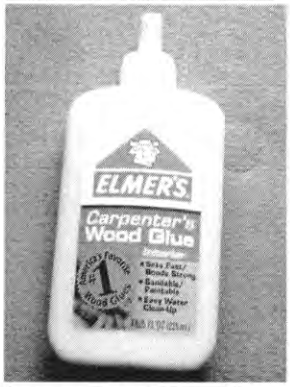
(4) 3/4" Long screws for the above flange.



(1) A spreader for smearing glue.



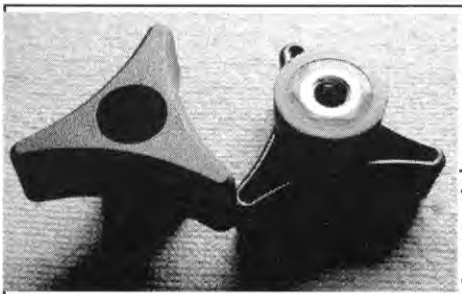
(1) A tube of marine adhesive.



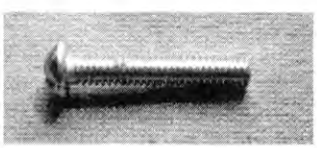
(1) Yellow carpenter's glue.



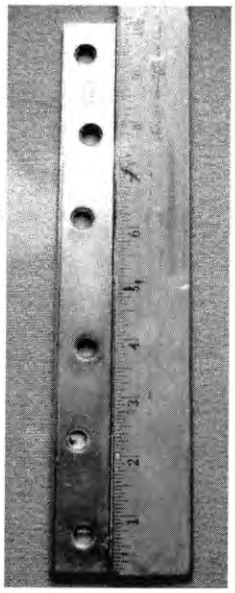
(1) A roll of tool box drawer liner. This is a rubbery material for the camera tray and car mount base. It's best to use this instead of cork because it helps cut down on vibration from the car.



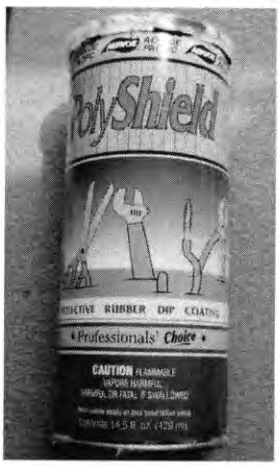
(2) screw knobs with 1/4" threads. Don't get knobs that sit too tall. These are an inch, and that's about the limit. Also, you'll save yourself some work if you get knobs that allow the bolt to screw all the way through as opposed to stopping at the top of the knob.



(2) bolts 1 1/2" long x 1/4". These need to fit the thread on the above knobs.



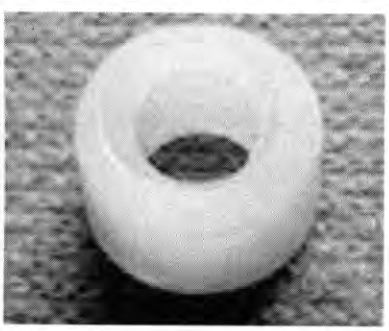
(2) steel mending braces.
10" long x 1" wide.



(1) A can of "polyshield". This puts a rubber coating of whatever you dip into it. Not totally necessary, but it will help cut down on car vibration.



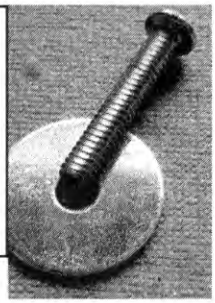
(4) bolts 1/2" long x 3/16" with nuts.



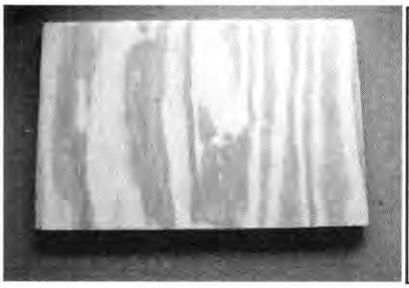
(4) Nylon spacers.
1/2" diameter by 1/4" deep.
Make sure the above bolt can fit through the hole. See step 14 for more details.



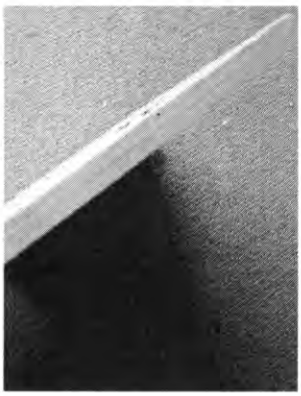
(12) Fender washers. 1 1/4" to 1 1/2" in diameter. (Fender washers have a smaller hole than regular washers. ☐



(4) 1/4" bolts by 3/4" long with nuts. Make sure this bolt can go through the hole in the washer without falling ☐



(1) 3/4" block of plywood around 6 1/2 by 9 inches. See step 20. ☐



1/4" block of oak. You'll find this in its own little section of the hardware store. It might read something like "Hobby Lumber". It doesn't have to be oak, but it does need to be a hard wood. You'll need two pieces around 6 1/2" long and between 3 and 3 1/2 inches wide. I bought a 24" long piece and cut it with a back saw and mitre box. ☐

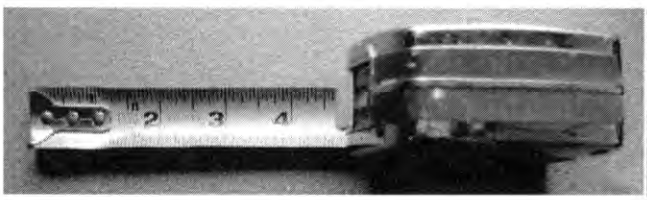
TOOLS LIST FOR THEY DRIVE BY NIGHT



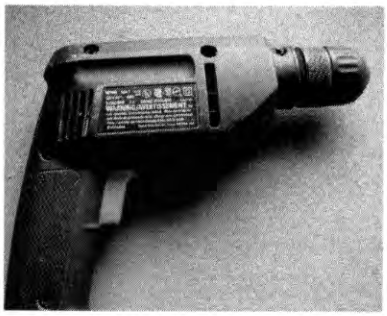
A mitre box with saw. This is for cutting the bit of oak. You don't have to have it, but it does help keep your cut straight and clean. ☐



Some kind of blade or scissors to cut the tool box liner with. ☐



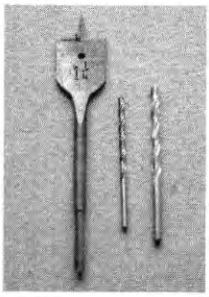
A tape measure ☐



Drill.



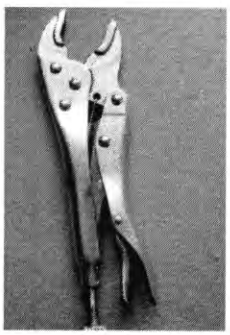
Cutting oil.



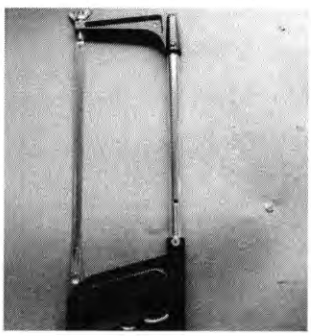
Drill bits.
13/64"
1/4"
1 1/4"



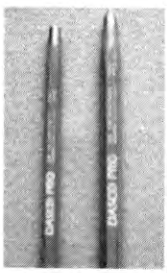
Hammer.



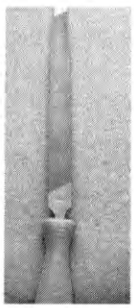
Vice Grips.



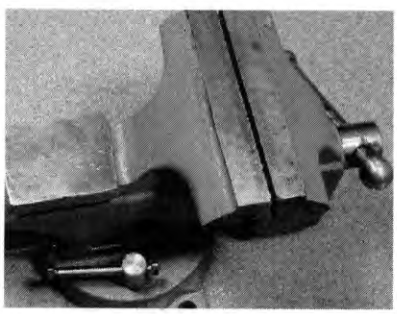
Hacksaw. The blades should have between 4 teeth per inch to 16 teeth per inch.



Prick Punch
Center Punch
If you've made the crane, you know about these.



File or Grinding stone. For taking the burrs off the cut metal



Vice. See about the vice in the Big Combo Crane section



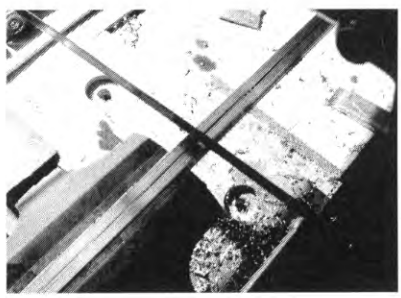
Combination square.

1.





Line up 2 of the aluminum bars and lock them in to your vise. Measure off 18" and cut off the excess. Pair off your other 2 bars and do the same thing. If you're feeling adventurous, you can do all 4 at once.



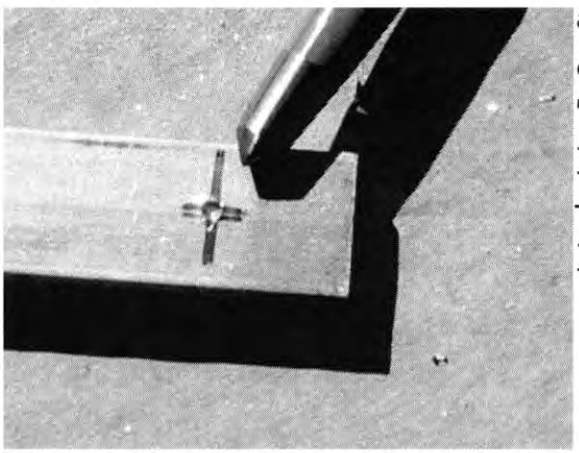
2.



Take your file or grinding stone and file the rough bits off the freshly cut aluminum ends.

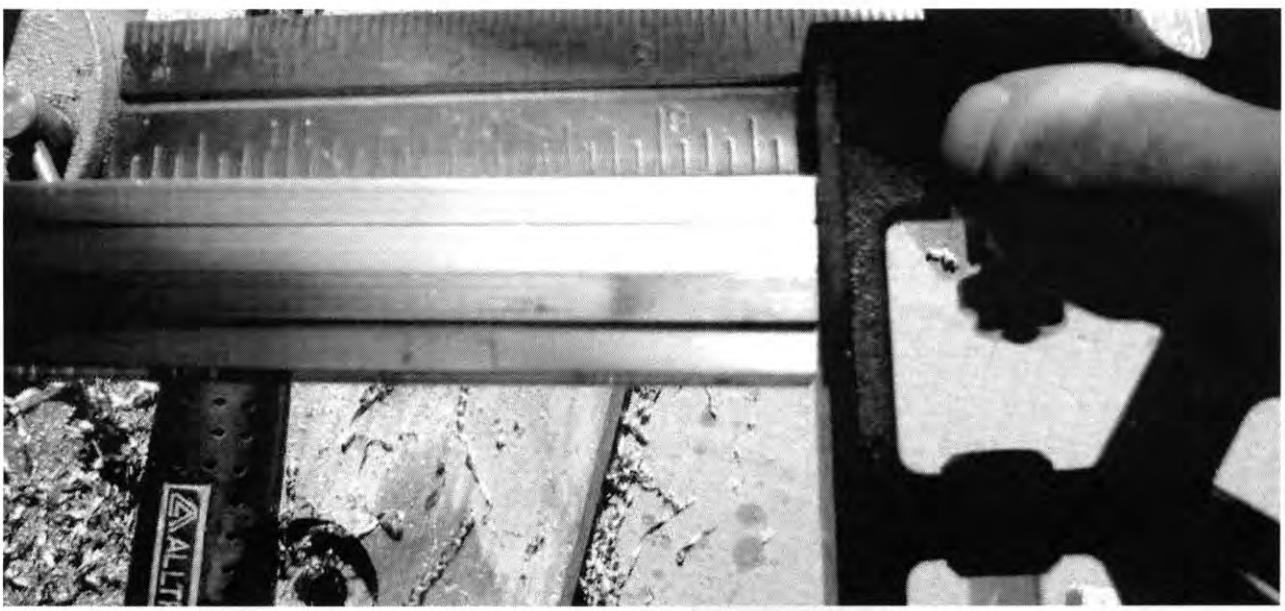
3.

On two of the bars on each end, measure down 1/2" from the end and draw a line. Then at that line measure half-way across the width of the bar and draw another line.



Take your center punch and a hammer and thwack a dimple where the two marks cross. Remember, do this on each end.

4.



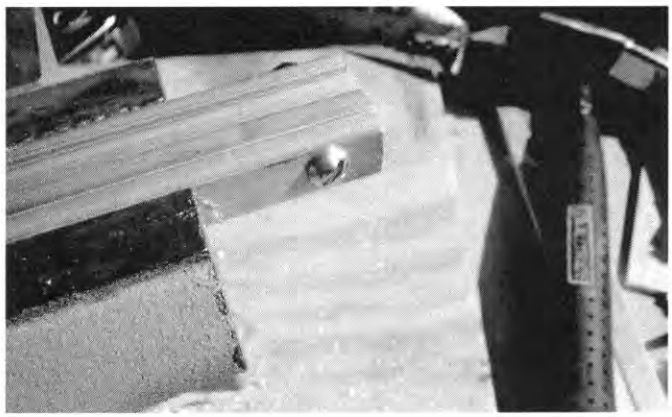
Put the marked bar on top of the other three and clamp them in to your vise. Use your combination square to make sure all the ends are even.

5.



Put a 13/64" bit in to your drill. Dip the bit in the drill oil. Set the tip of the bit in the dimple, make sure your drill is level, and drill a hole through all 4 bars at once.

Put a bolt through the hole and add a nut. This will keep your bars even. Take them out of the vice, flip them around, and drill a hole at the other end of the bars. File off the burs and set them aside.



6.

Now we're going to remove the clip from the clip board. See the little rivets that hold it on? Take a pair of pliers or vice grips and squish the rivet.







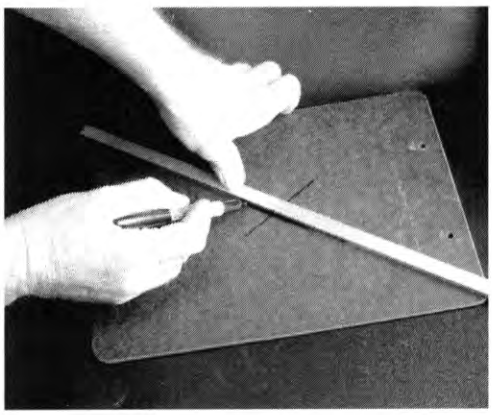
See, like this.

Do both rivets and pull the clip off.

7.

Find the center of the clip board by setting a straight edge from corner to corner. draw a line near the center of the board. Do the same from the opposite corners and draw another line.

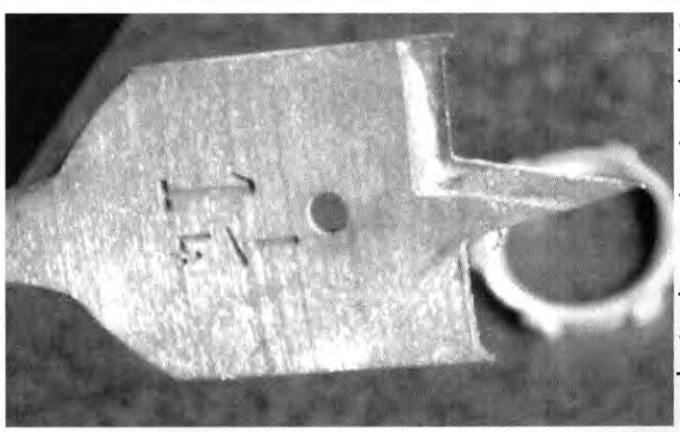






Where the lines intersect is dead center of the board.

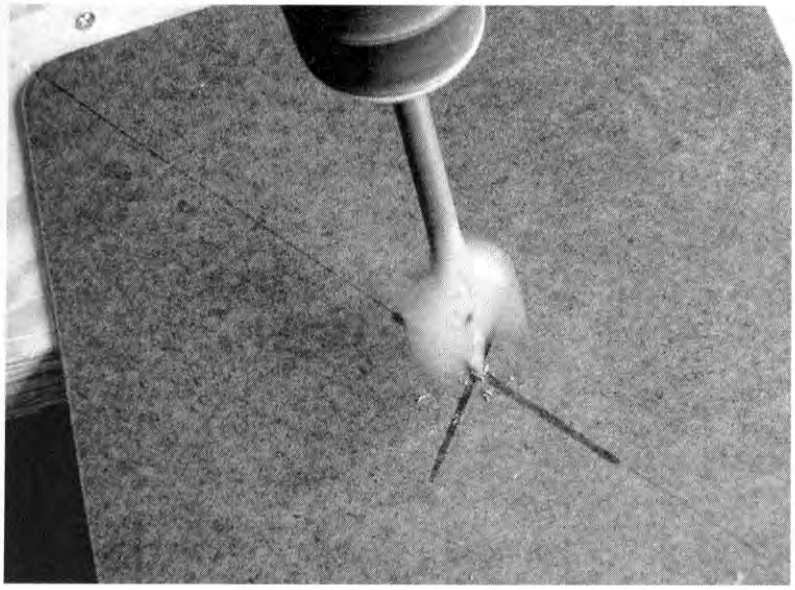
8.



Now we need to drill a hole on that 'X' for the electrical pressure coupling. I'm using a 1 1/4" bit.

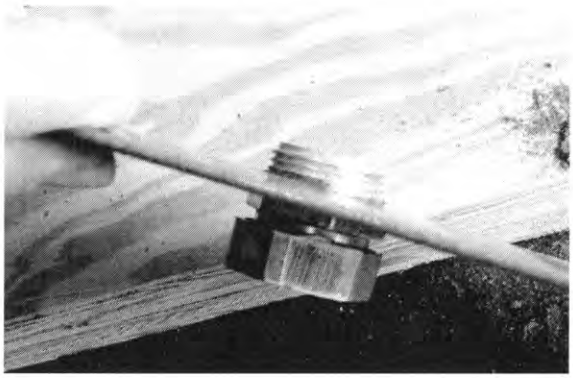
A hole saw will work too.





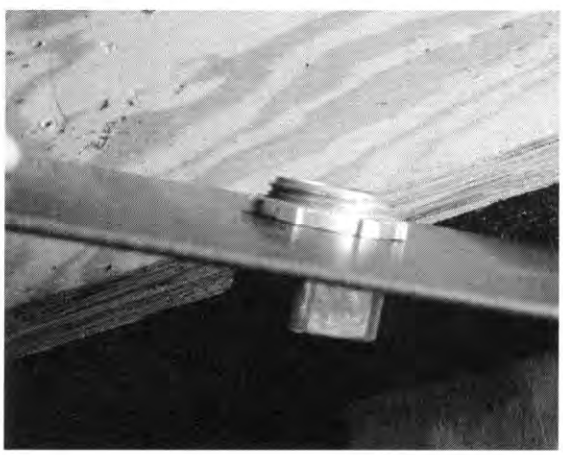
Drill a hole in the middle of your board.

Slide the coupling up through the hole to make sure it fits. It should be snug.



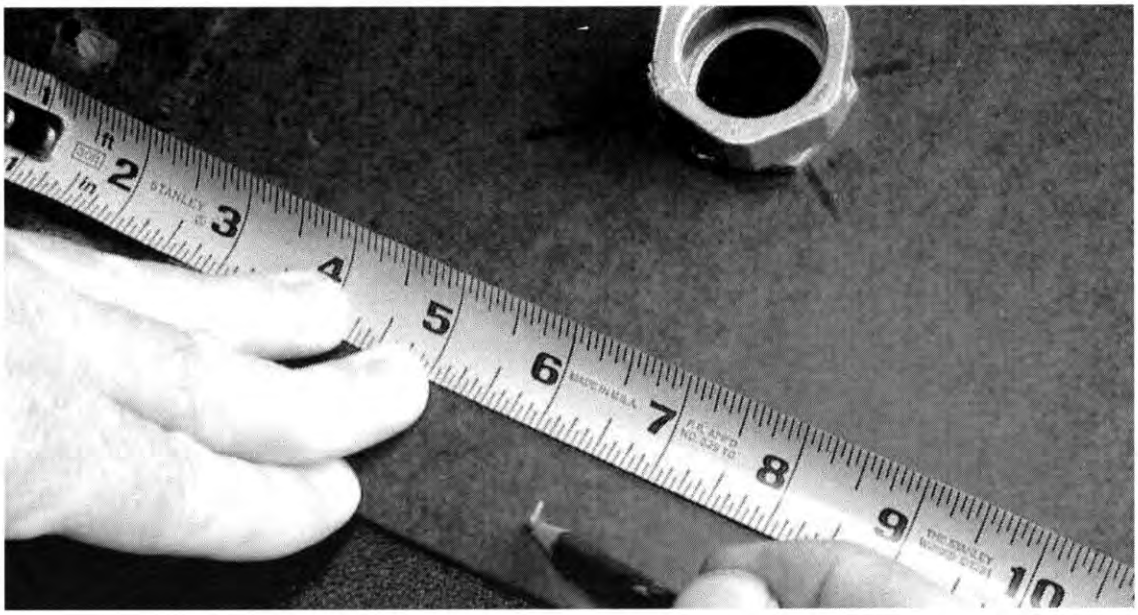


Take the coupling's retaining ring and screw it on the opposite side of the board, so that it holds the pressure coupling in the hole.



Once you've made sure everything is hunky dory with the pressure coupling and its hole, you can either remove it or leave it in there. Doesn't much matter at this point.

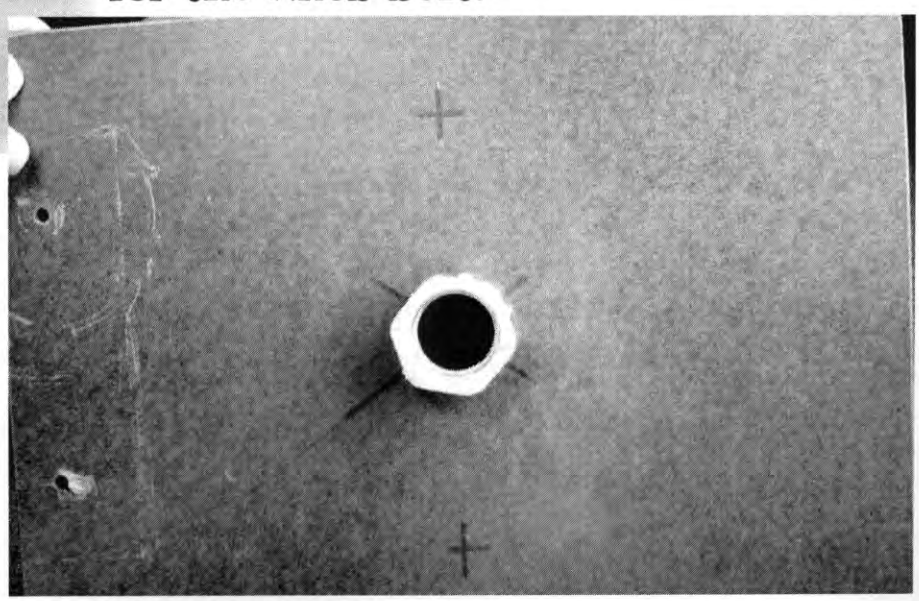
9.



Next measure down the length of your board and mark the half-way point about an 1 1/2" from the edge of the board. In the case of my clip board, the half-way point is 6 1/4". Do this on the opposite side as well.

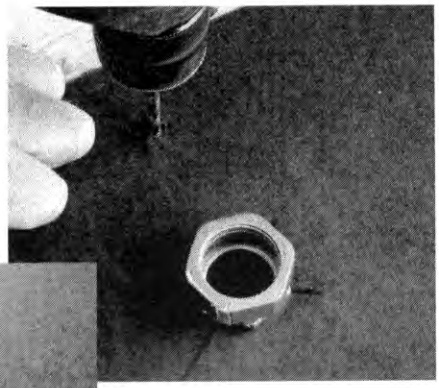


Once you have your half-way marks, measure in 1.5" from the edge and make another mark. Now you should have a little cross where the two measurements intersect. Do this on the opposite side as well.
This is where we'll be drilling a hole for the knob bolt.



Can you make out the two crosses on each side of the coupling?

10.

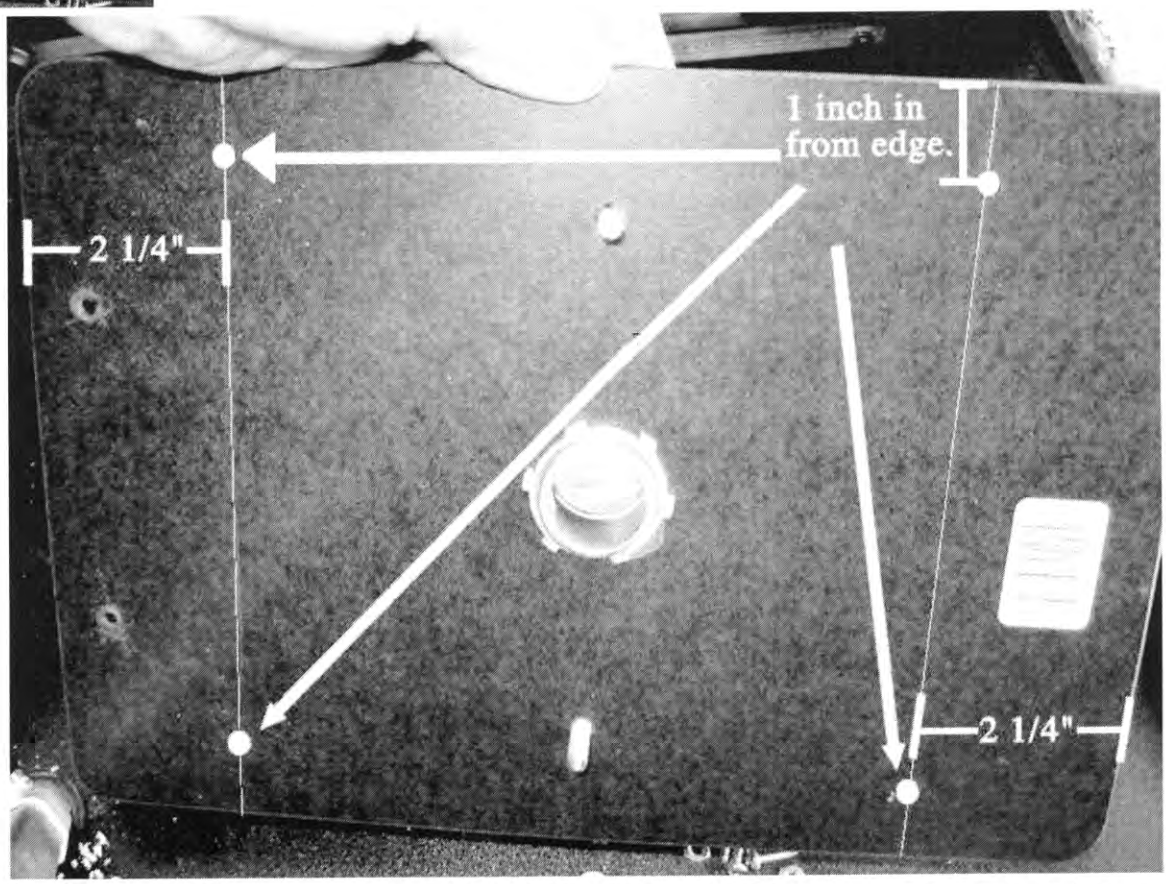


Drill a hole on the crosses just big enough to accommodate your bolt. I'm using a 1/4" bolt, so I'm going to use a 1/4" bit. It will be a little snug, and I'll have to screw the bolt in, but that's what we want.



Here are the bolts screwed in. These are 1 1/2" long. Go ahead and screw them in.

11



OK, now we're going to mark the board for 4 more holes. Take a close look at the photo above. Draw a straight line across the width of the board, 2 1/4" from the edge on each end. Then on that line, measure in 1" from the edge and make another mark. This is where we'll drill some holes (see the white dots?).

12.

OK, set your marked up board aside for a minute and grab your 4 big suction cups. We're going to attach the aluminum bars to the suction cups by drilling a little hole in the suction cup handle.

Pick a point in the middle fatty part of the handle and drill a hole through it. I'm using a 13/64th size bit for this. Do all 4 suction cups in the same spot. This is the same size bit I used on the aluminum bar holes.





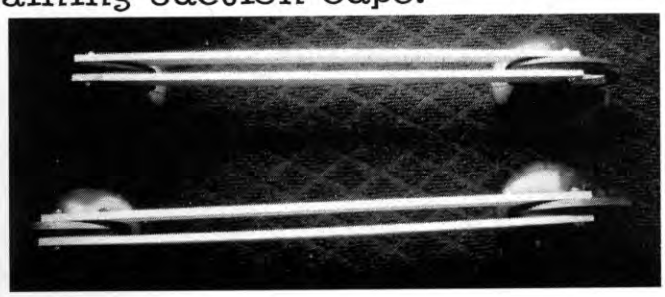
13.

Take your suction cup, 2 bars, and a nut and bolt. My bolt is 1 1/4" long. Yours may be different depending on the thickness of your aluminum bars. The holes may also be a different diameter depending on your bolt.





Place the bars on each side of the suction cup handle and line up the holes. Slip the bolt through and screw on the nut. Do this on the remaining suction cups.



14.

Let's look into the future a bit. Take a look at the photo below. Remember the marks we made in step 11? We're going to drill holes to put on these little nylon spacers.





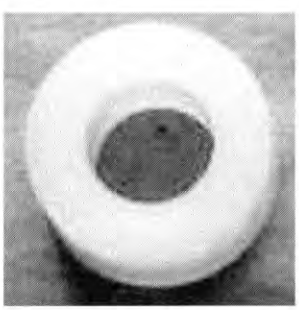
These spacers come in a huge variety of sizes. Here's what we want:



The spacer needs to be small enough in diameter to fit between the two aluminum rods that are attached to the suction cups. They can even touch the bars, but not so big as to bend the bars out. The spacer also needs to be bigger than the nut that is holding it on.



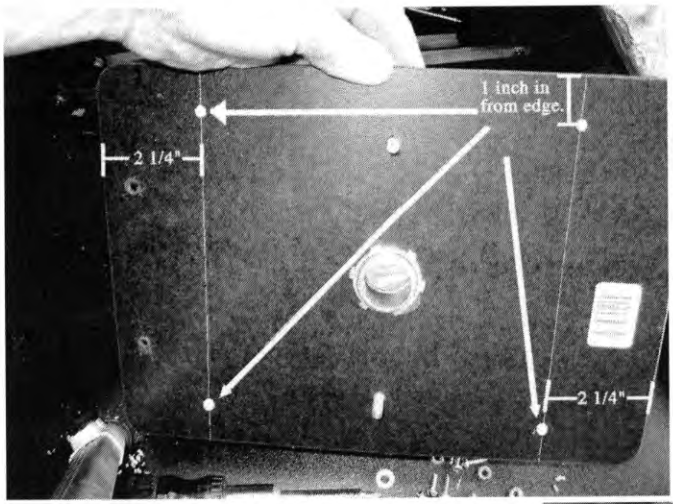
The spacer and the nut should not be any higher than the top of the bar. As you can see, this one goes about half way.



And of course, the hole in the spacer needs to be large enough to take the bolt you're using.

So, to put all that together:

Because of the bars and suction cups I'm using, my nylon spacer can not be more than 1/2" in diameter, a 1/2" tall, and the hole needs to be big enough to take 3/16" bolt. Yours may be different.

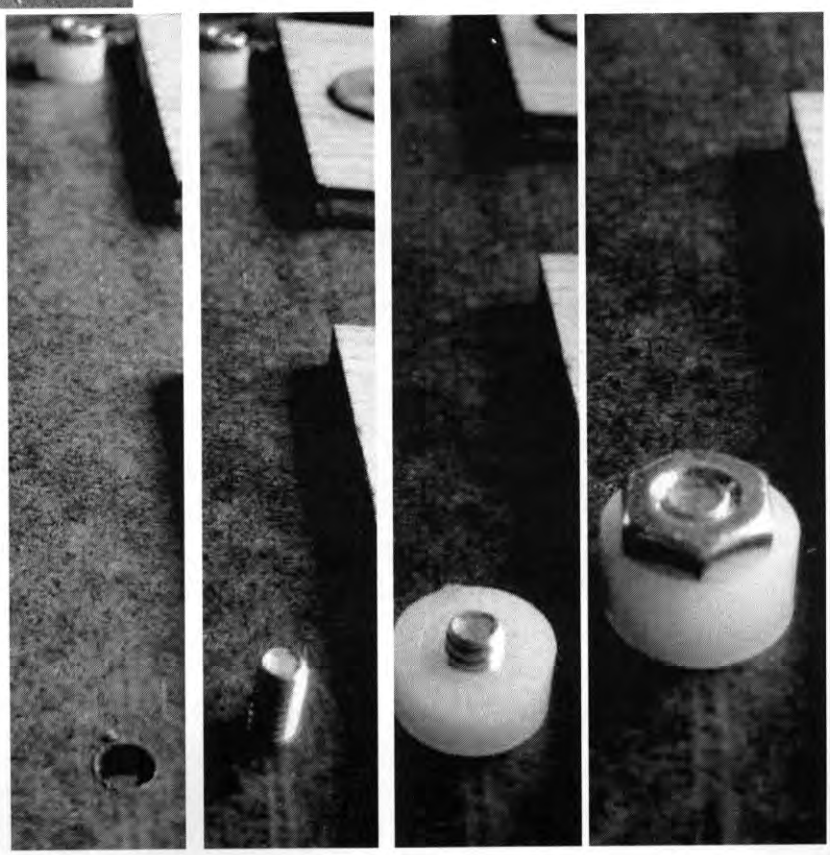


Next, drill holes for the spacers where you put the marks in step 11. I'm using a 3/16" drill bit.

15.

Attach your spacers with a bolt just long enough to go through the spacer and take a nut on the end. In this case, my bolt is 3/16" by 1/2" long.

Do this on all 4 holes.

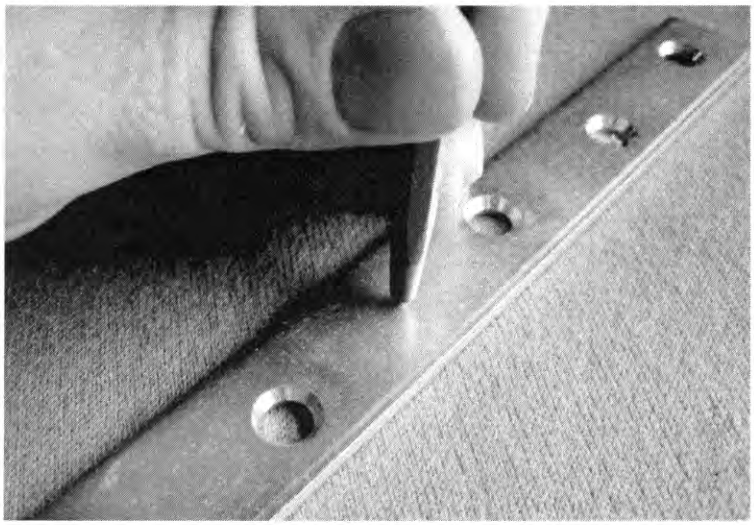


1. 2. 3. 4.

Bee-u-tee-ful!

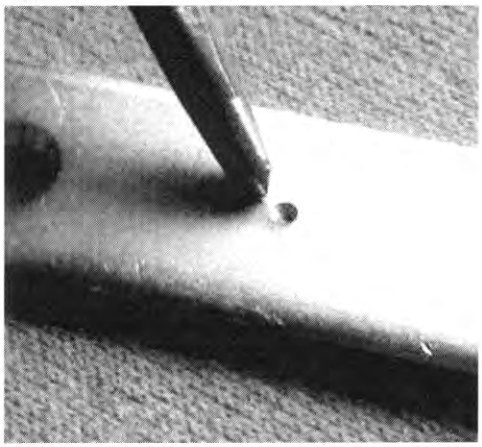
16.

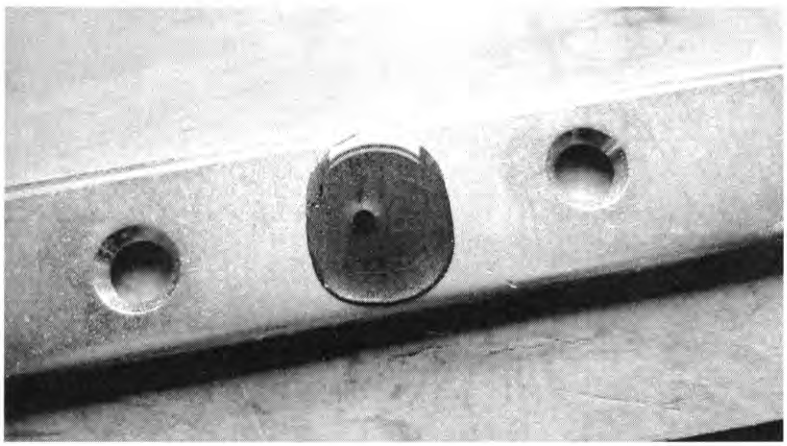
Now we need to drill a hole in the center of the two steel braces.



The braces are 10" long, so in the middle of the brace at 5" I'm going to make a dimple with my prick punch.

Just give the punch a couple of good thwacks with a hammer.



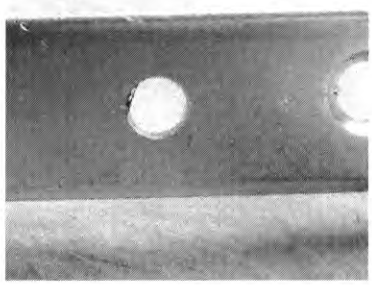


Clamp the brace down on your bench on top of a scrap bit of lumber.

Add a little drilling oil to the dimple.









If the oil dries up while you're drilling, just add a little more.

When you're finished, clean up the metal with a little acetone or hot water and a good grease cutting soap.

17.

This next step isn't ABSOLUTELY necessary, but highly recommended. We're going to "rubberize" the metal brace. This does a couple of things: it helps hold the mount to the rails, and it helps to cut down on vibration coming from the car.



Take the braces and simply dip them in the polyshield.



Hang it from a wire over the polyshield for a few minutes to let the excess run off.



Close up the polyshield can and let the rubber on the brace dry.

Once dry, flip it around and repeat the steps for the other side. Feel free to give it 2 or 3 coats.

Repeat the steps on your second bar.

Let the polyshield dry completely before going on to the next step. We are almost finished with the base.

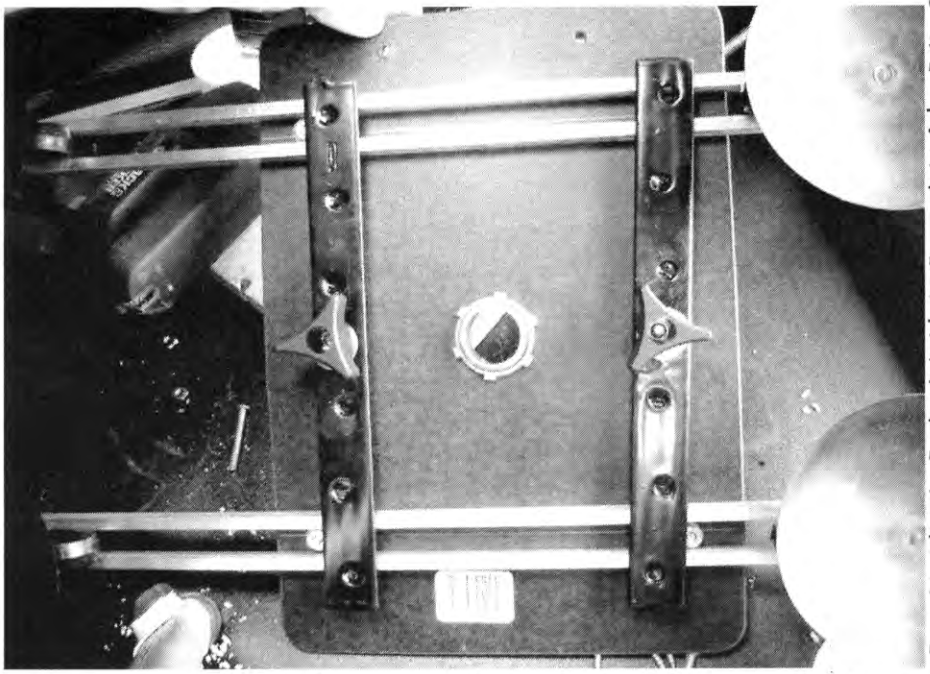
While you're letting the rubber dry, you can set the base aside and skip up to making the camera platform. Frankly, I'd take a break and finish up tomorrow.

For the next step you'll need all the pieces that you've built so far, plus the threaded knobs.

18.

Just so you know where we're headed, let's put the base together.

Take your suction cups with the rods attached and place them on the base as shown in the photo. The nylon spacers you put on in step 15 ride in-between the two bars.



Take the metal braces and slide the holes you drilled in them earlier over the 1/4" bolts. Take your threaded knob and screw them on to the 1/4" bolt.

They should be placed so that the ends of each metal strap clamps down on the suction cup bars.

We still have a little work to do on the base that requires stiffening up the former clip board, but that requires some glue, and so does the top of our base and the camera platform. We'll just do all the gluing at once. So first, let's build the ball and socket joint and the camera platform.

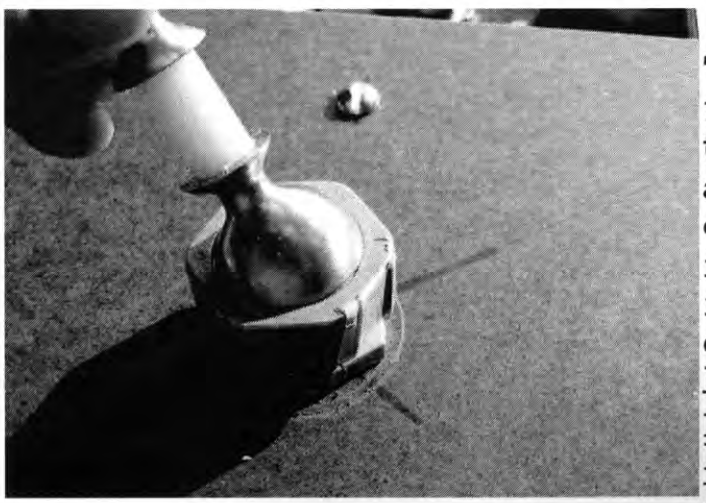




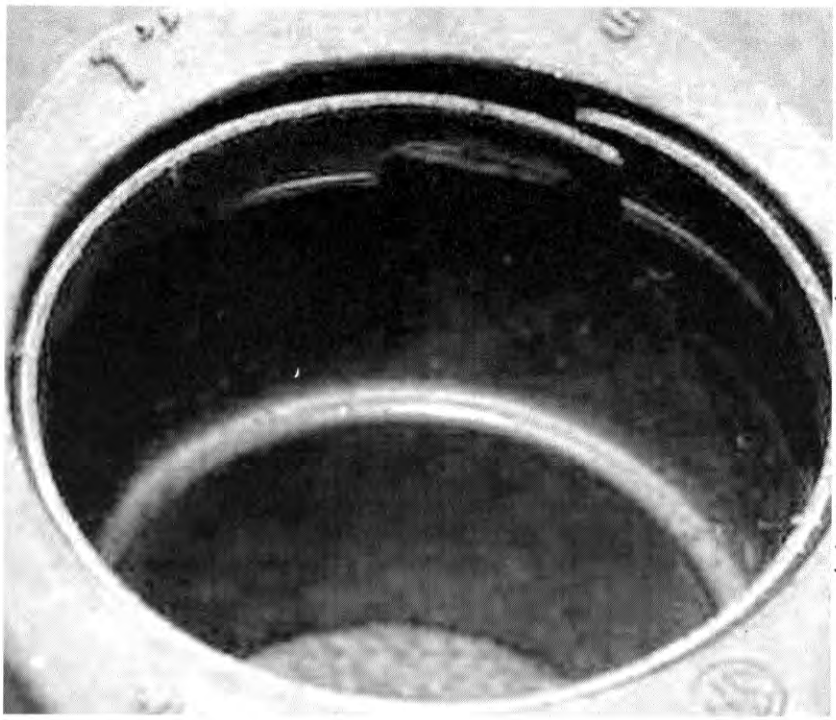
Here are the parts for the ball joint. These are simply 2 solid metal drawer pulls along with a a 1" nylon spacer and a threaded rod that fits the drawer pull threads.

Finding the right drawer pulls

First, they have to be round. Second, they have to be metal. And third, they have to fit the electrical pressure coupling. So while you're at the hardware store, go get your 1" electrical pressure coupling first. Then head over to the drawer knob department and start sticking round knobs in to the coupling.

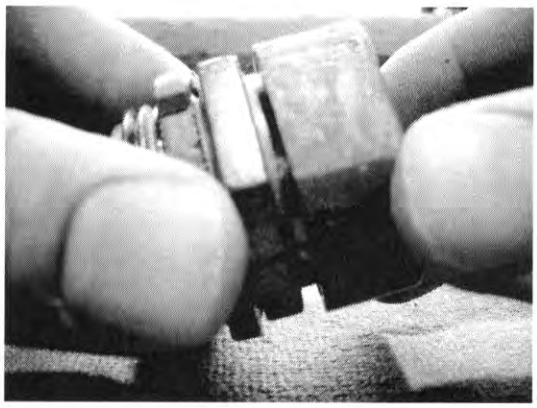


The fatest part of the ball needs to fit, just barely, in to the part of the coupling that applies the pressure. So experiment around with different size knobs until you find one that doesn't move once you tighten down the big nut on the pressure coupling. Make sure that the largest circumference of the knob is against the pressure ring. If the ball is too far in or too far out, it will never tighten properly.



See the little metal ring just inside the top of the coupling? This is the part that tightens down on the ball, and believe me, once you tighten it down with a wrench, it's not going anywhere.

Take a look at the following photos to make sure you get a good fit before leaving the hardware store.



Loosen up the big nut that tightens the pressure ring.



Find a knob that fits in the opening.

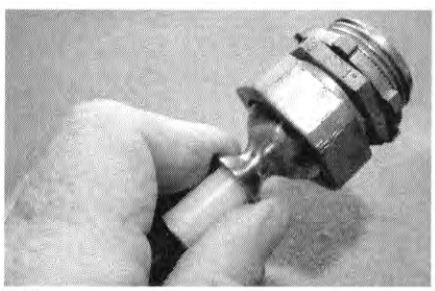
Oops. I put it too far in.

Dang. Not far enough.





Just right. Now tighten the nut down.



There. That's not going anywhere.

Now that you have the right drawer pull, head over to the part of the hardware store where they keep the threaded rod. Find the correct size for screwing in to the threads on the knob. You only need a couple of inches, but the least you'll probably be able to buy is 12". The knob I found takes an 8/32" rod. Yours may be different.



WAIT! Don't leave the hardware store yet. Take that threaded rod over to the nylon spacers. You need one about an inch long. The hole should be just big enough to take the size of the rod.

The picture on the left is the spacer and the rod cut to the proper length.

19.

BUILDING THE BALL AND SOCKET JOINT

Find out how much threaded rod you need by screwing one end of the rod as far as you can in to the drawer pull. Mark the rod where it meets the base of the drawer pull and unscrew it. Measure from that mark to the end of the threaded rod. It will probably be under a half inch. Now double that measurement then add the length of the spacer.

So let's say you're able to screw the rod into the knob a 1/4", double that. So now we have a 1/2". Add the length of your spacer. In this case: 1". So that's 1 1/2 inches total. Measure off 1 1/2 inches on the rod and cut it there. It's better to cut the rod a little shorter than a little longer. If it's too long, the knobs won't tighten against the spacer.





Take some pliers or vice grips and grab the rod somewhere in the middle. You can tear up these threads in the middle all you want. Next tighten the PA-JEEZUS out of that rod into the drawer pull.

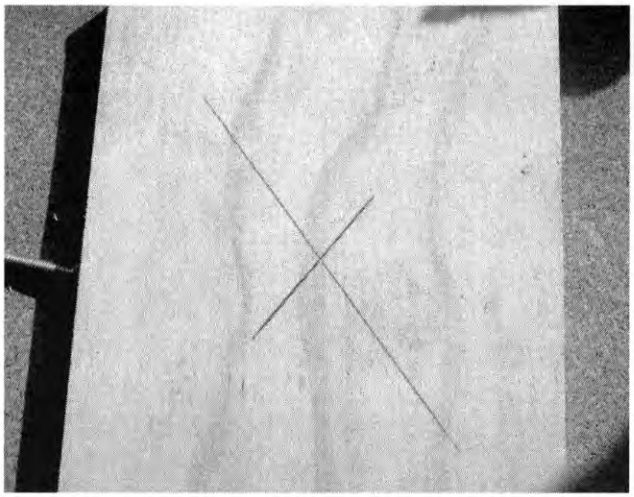


Slip the spacer on...



...and add the second drawer pull to the other end. Tighten the whole thing down with some vice grips.

BUILDING THE CAMERA PLATFORM



20.

Get a 3/4" thick piece of plywood that measures around 6 1/2" by 9". Find the middle as you did with the clip board: take a straight edge from corner to corner and draw a line. Do the opposite corners so you end up with an "X". That's your center point.

Take the 1" floor flange and center it over the "X".

Mark where the four screw holes are on the plywood, and drill pilot holes for the screws. Use a bit that is much smaller than the screws you're using.





Use a 3/4" long flat head wood screw to attach the flange. Get screws that are pretty fat. Careful not to get them too big, they still have to fit through the holes on the flange!





Draw a line down the middle of the platform and drill 5 or 6 1/4" holes along the line. Obviously, it is pointless to drill where the flange is, but get a hole right next to the edge of it.

As you use this mount, you might find weird and beautiful ways to use it, so feel free to drill more holes anywhere on the platform. You can also do this later, as the need arises an a shoot.

Grab your second electrical pressure fitting and screw it tightly into the flange. Use a big wrench and really muscle that thing in there.

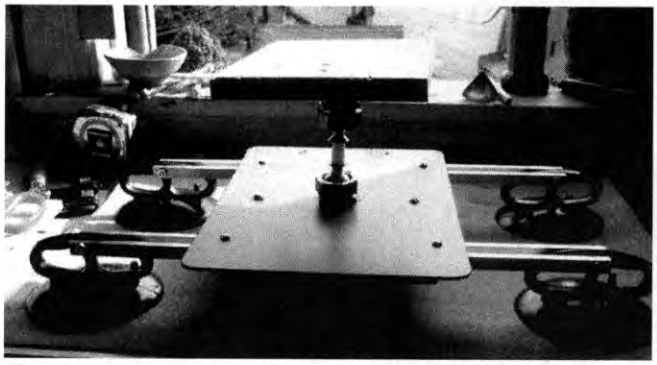




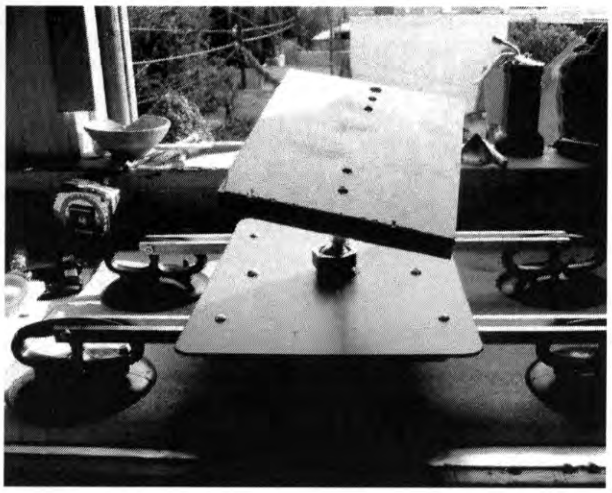
Remember the 1/2" insulating bushing (whatever the heck that is!) you picked up at the electrical department. Here's what they're for:



Drop one or two of them inside the pressure conduit, the larger open end up. This keeps the ball joint at the proper height so you don't have to monkey around with the thing every time you want to adjust the ball joint. You don't have to use these, it just makes life easier. Put one or two (you'll just have to experiment to see what works for your pressure conduit) in the clip board base conduit as well.



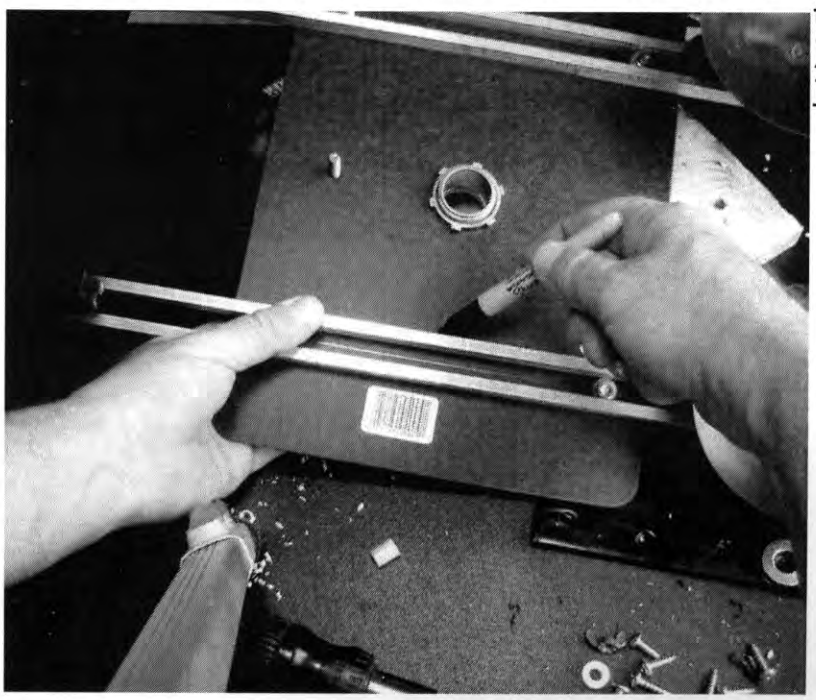
Put your ball joint in the pressure fittings and tighten them down. Monkey around with this ball and socket joint to get a feel for it. This baby can tilt everywhich way. Pure Genius!

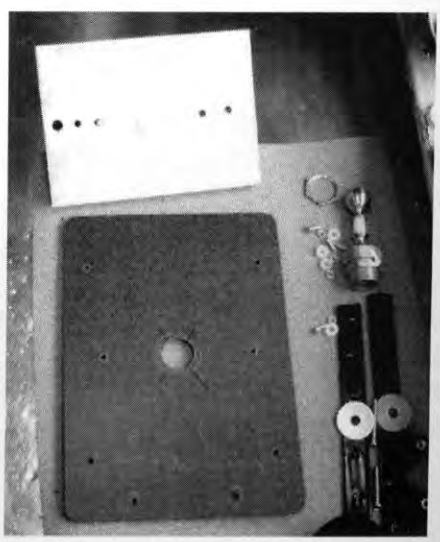


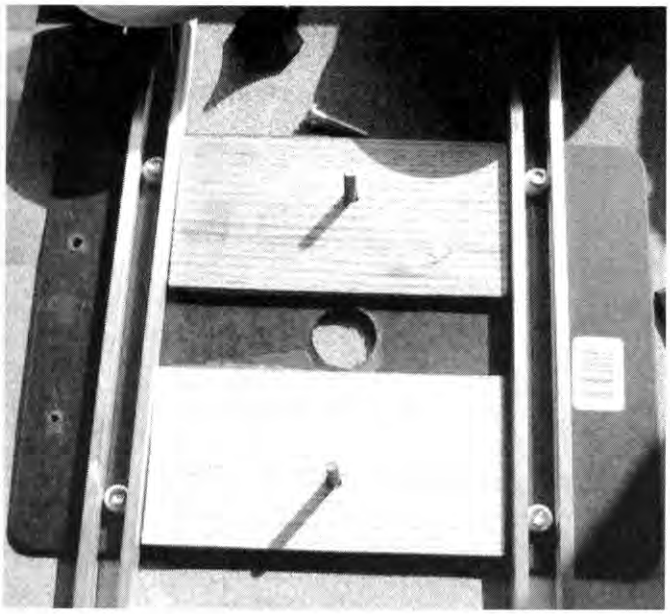
21.

So we're almost done. Just a few finishing touches. Take the camera tray and the ball mechanism off and set it aside.

Flip the clip board base over and remove the steel braces. On the inside edge of where the suction cup bars lay, draw a line the width of the board. Do this on the inside of both bars.





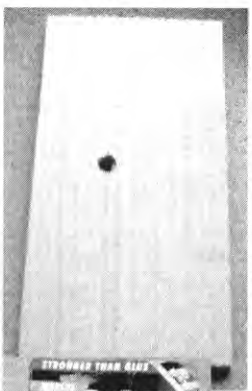


We're measuring this distance to strengthen the clip board, because it will bow if you tighten the threaded knobs too tight. So I'm going to add a couple pieces of 1/4" oak to the bottom.

Measure the distance between the two lines. My measurement ended up being 6 3/4". If your bars are thicker or thinner than mine...you get the idea.

The oak I'm using is 3 1/2" wide. DO NOT go wider than this or you won't be able to put the pressure conduit back in.

Cut your oak or other hardwood, to the correct length. Again, in my case that's 6 3/4". Now, you could try using 1/4" plywood here, but the oak is much stronger and doesn't give as easily.

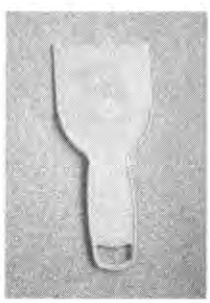


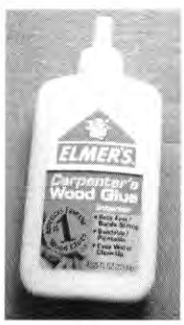
If you want to drill the holes now for the screw knobs, you can line up the oak on the clip board, then mark the oak where the screw knob bolt hole falls.

Frankly, I'd wait until you've glued the thing and it'll be easier. I don't know what I was thinking.



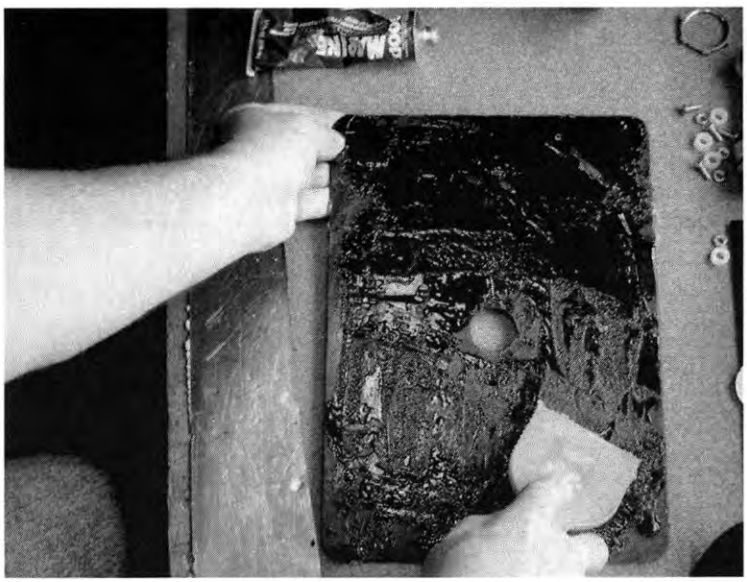




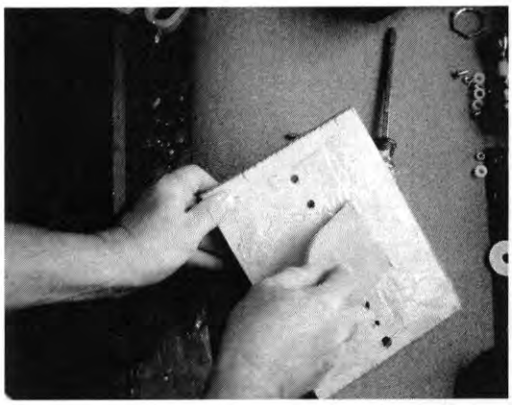


Collect the things you'll need for all the gluing. I'm using a marine adhesive to glue the padding on the mount and a yellow carpenter's glue to attach the oak pieces. I like the marine stuff because it stays flexible and works well with rubber. You'll also need something to smooth the glue on with.

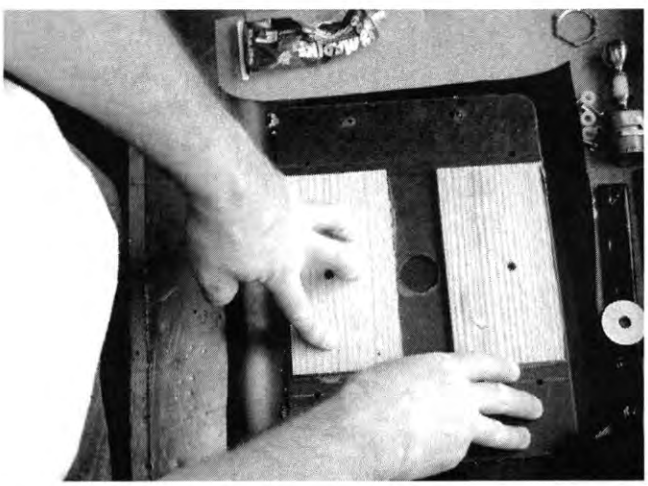
22.



Take the former clip board and glob on the marine adhesive. Do this in a well ventilated area. Mine wasn't and I swear I saw little garden elves in my frige. But that's a story for another day.



Do the same thing on the top of the camera platform.



Roll out the tool drawer liner and slap the two pieces down there.



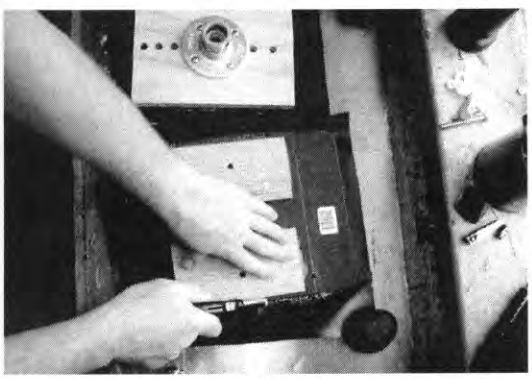


Smooth out some carpenter's glue on the oak pieces and center them between the lines you drew earlier.



Slap some weights on the whole shebang and let them dry overnight.

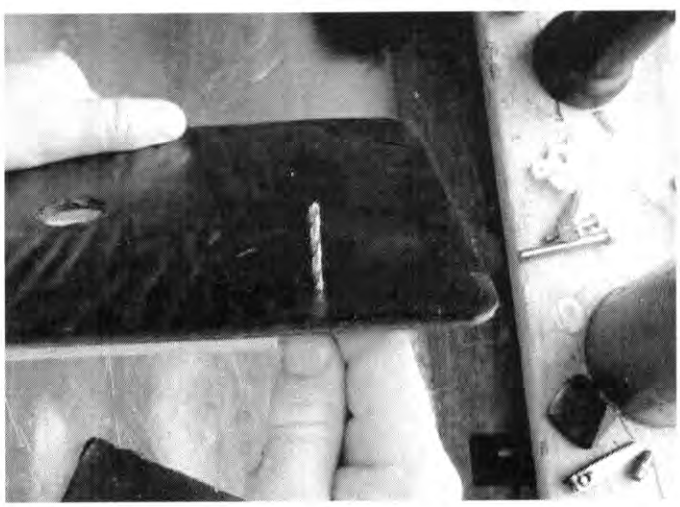
23.



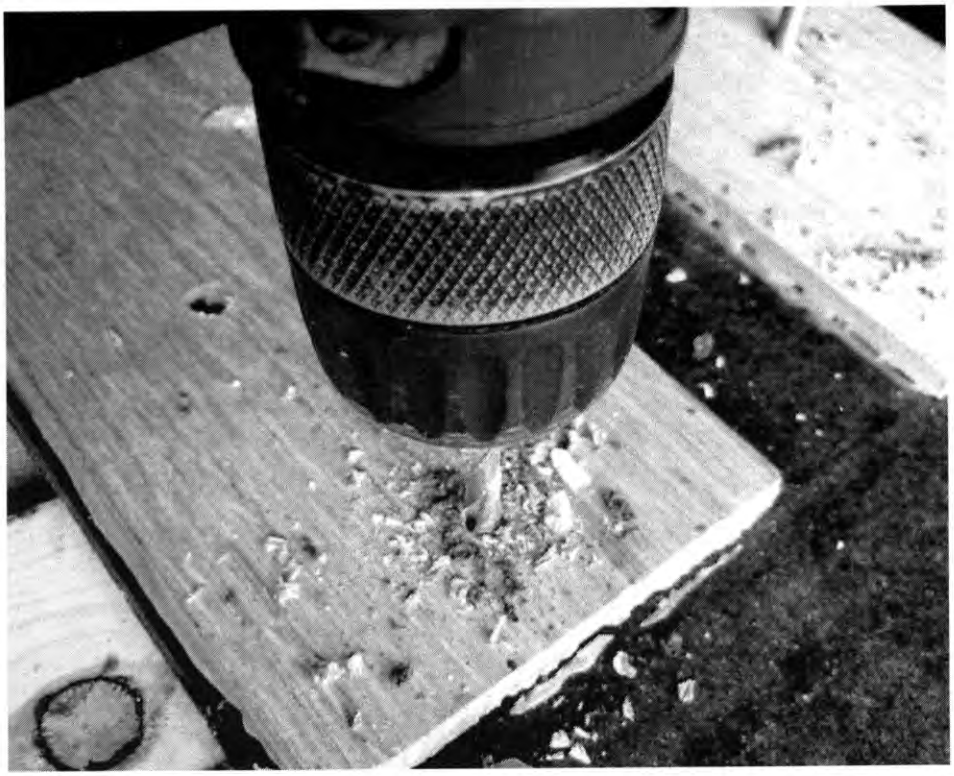
Trim off the excess tool drawer liner with some kind of blade. Don't forget the big hole in the center too.

Take a drill bit and poke holes through the top pad where all of your holes are in the clip board.

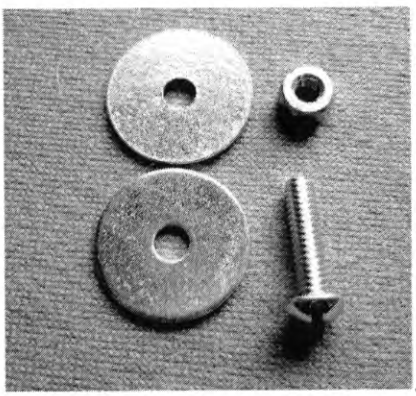
On the larger 1/4" hole that holds the bolt for the threaded knob, you'll just have to feel around through the pad until you find it. When you do, load up a 1/4" bit and drill straight through the pad and oak.



24.



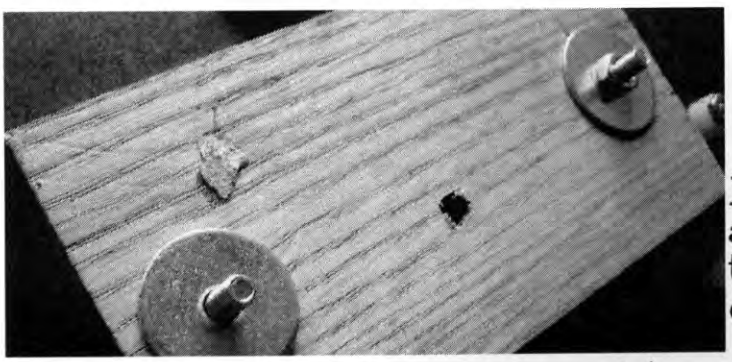
Once you have all the holes poked in the pad, flip the thing over. Pick a point somewhere near the middle and each end of the oak and drill a 1/4" hole. So that's 4 new holes in all, right?



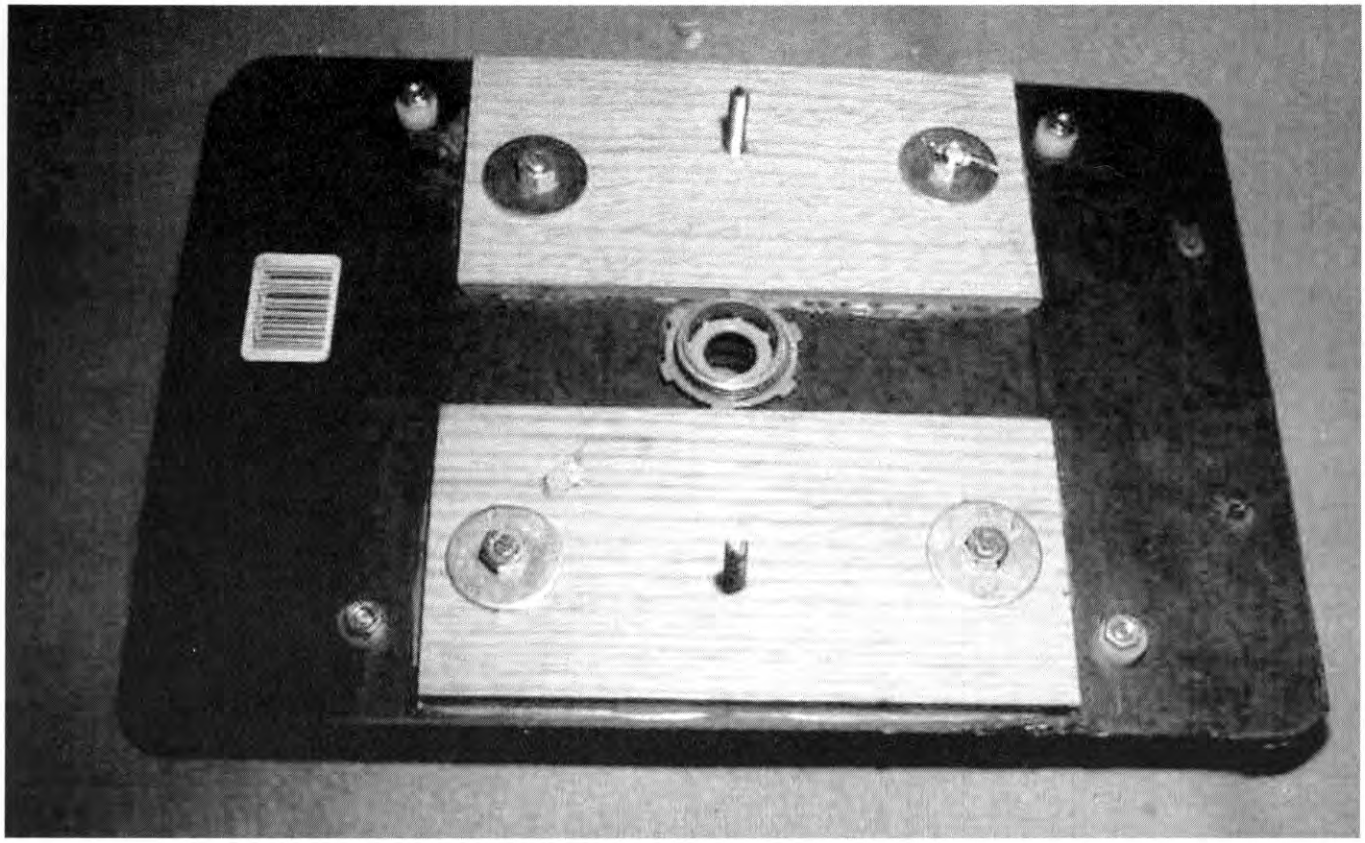
For each new hole you'll need 2 fender washers, a bolt, and nut. The bolt should only be long enough to be flush with the top of the nut when you screw it down. If the bolt protrudes beyond the nut, take a hacksaw and cut it off. My bolt is 3/4" long.

Put on a fender washer and screw the bolt into the hole.

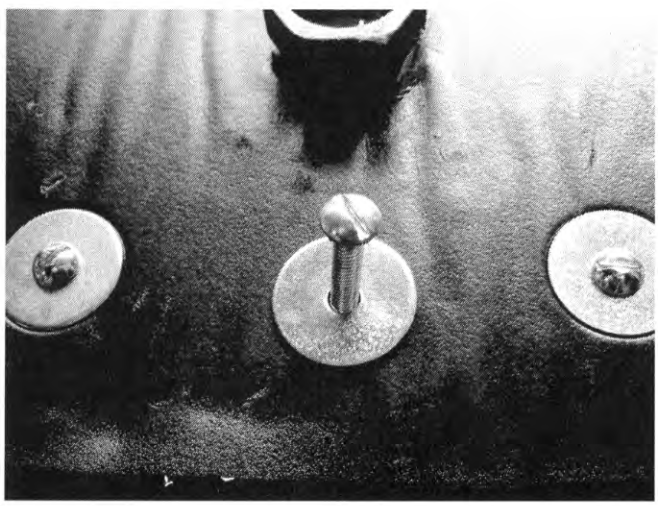




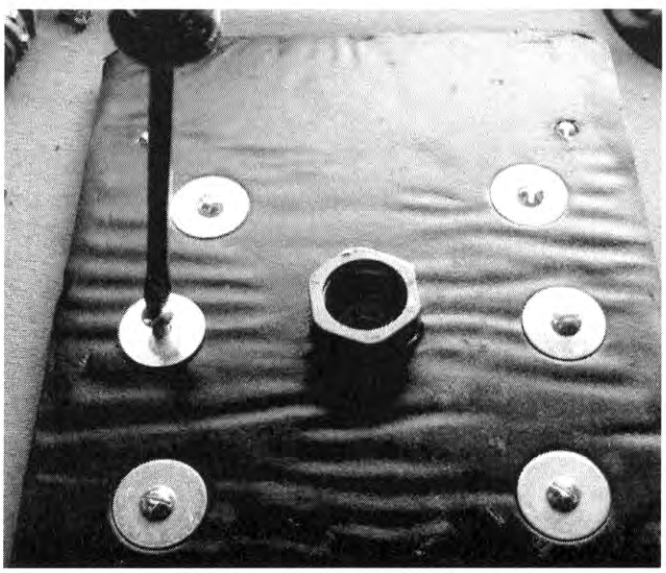
Do the same on the bottom and add a nut. Remember, if the bolt goes beyond the nut, cut it off.



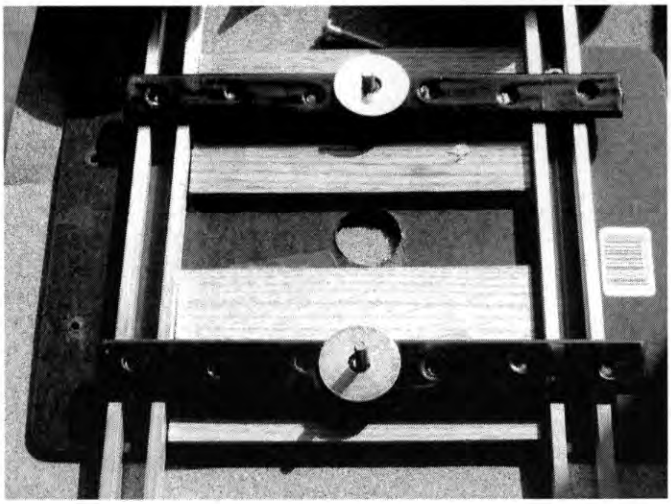
Put all your spacers and nuts back on and the pressure coupling back in the center hole.



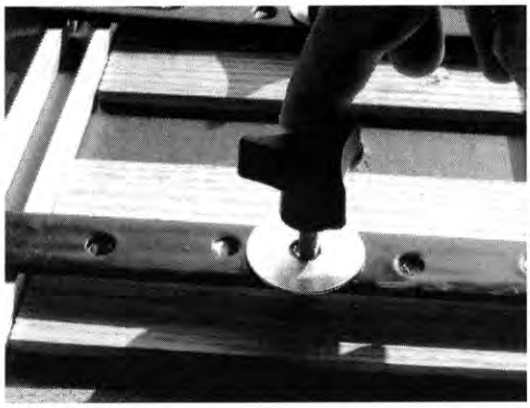
Add a fender washer to the bolts that holds the threaded knobs.



It's starting to look sexy, baby, yeah!



When you put the steel straps on, add a fender washer before you put on the screw knobs.

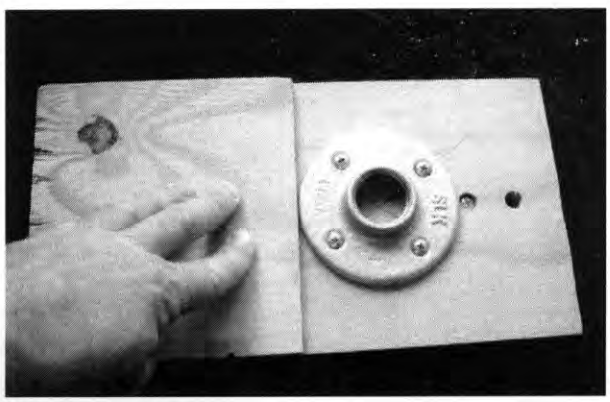


Flip the whole business over, add the camera tray, and you're done. One car mount ready to test.

Make It Groovy

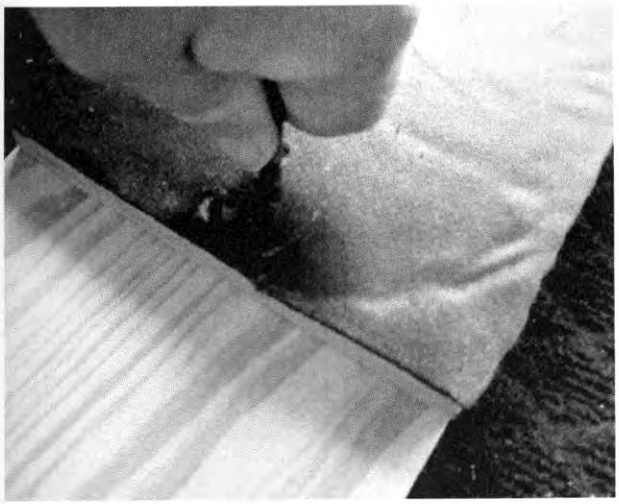
There might be times when you use this car mount, that the camera tray will be up-side-down, and you'll need to mount the camera on the bottom of the tray. Because of the large floor flange most cameras won't quite fit. So in this section we'll be making a little platform that extends off the bottom of the camera tray. You won't need any different tools, but you will need an old mouse pad and a 1/4" thick piece of plywood that measures around 6 by 6 1/2 inches.

Take your plywood and center it on one side of the camera tray.





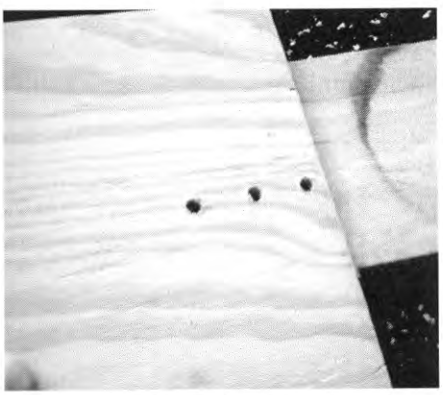
Keep the board in place and flip everything over...



Take a nail or some other long thin thing with a point (I'm using the prick punch) and push it through the existing holes on the camera tray, marking the plywood underneath.

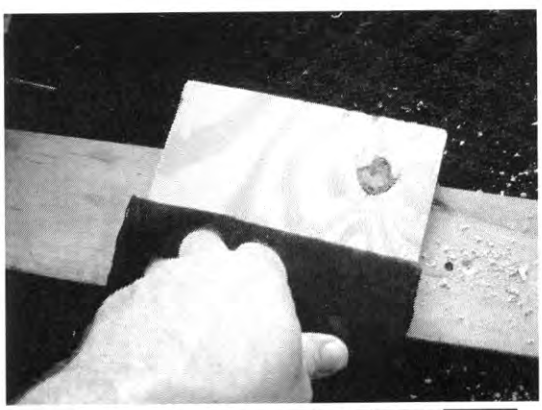
I have three holes on the camera tray, so I'm going to drill 3 holes on the extension.





Use a 1/4" or a little larger bit to drill these holes.

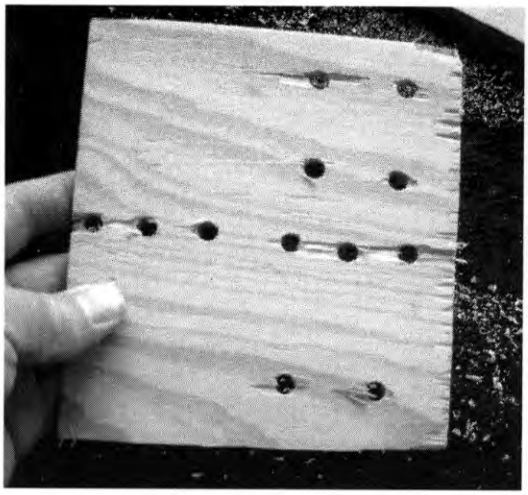
Line the holes on the extension up with the holes on the camera tray...





...and draw a line across the extension using the edge of the camera tray as a guide.

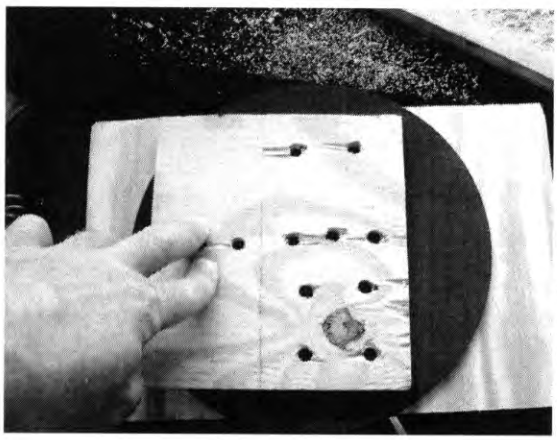




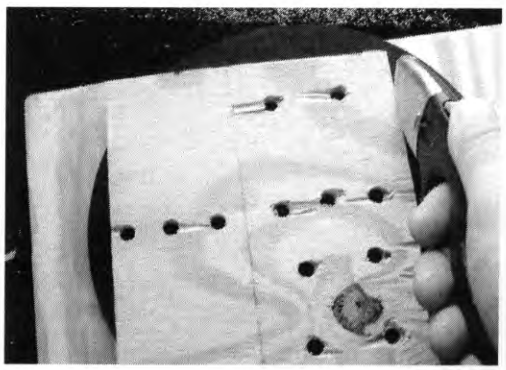
Use a 1/4" bit to drill a bunch of holes between that line and the outside edge. Placement is not critical, but do drill a hole or two near the line you drew.

Take your mouse pad and tear the cloth cover off of it.





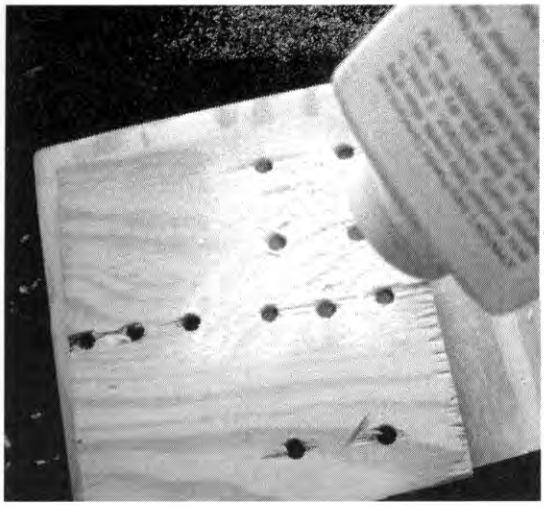
Set the extension on the pad and cut off the excess mouse pad. Then cut the pad where the line on the plywood lays.



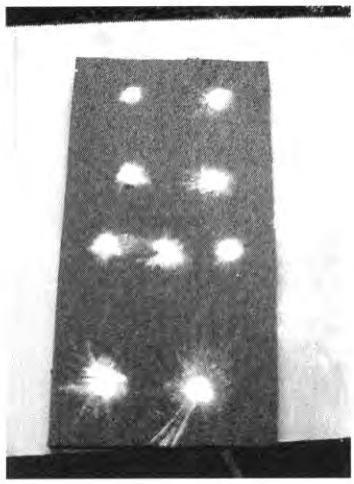


That's the ticket!

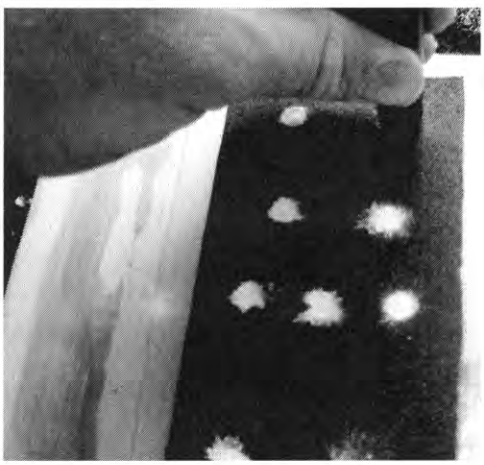
Now we need to put some holes in the pad to allow for the camera screw. For this, I'm going to use a fabric punch from a grommet kit. A razor blade or exacto knife works well too.



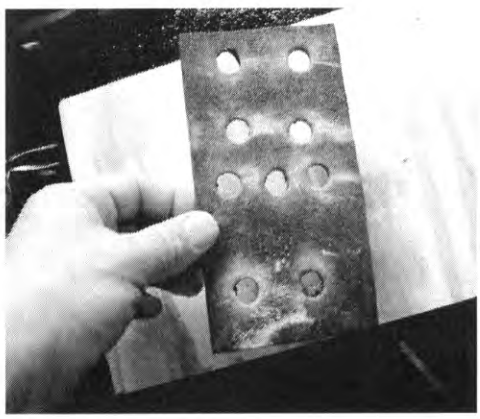
A really easy way to mark the mouse pad for the holes is to use chalk or baby powder. Just line the pad up on the board and flip the whole thing over. Take some baby powder and sprinkle it in the holes.



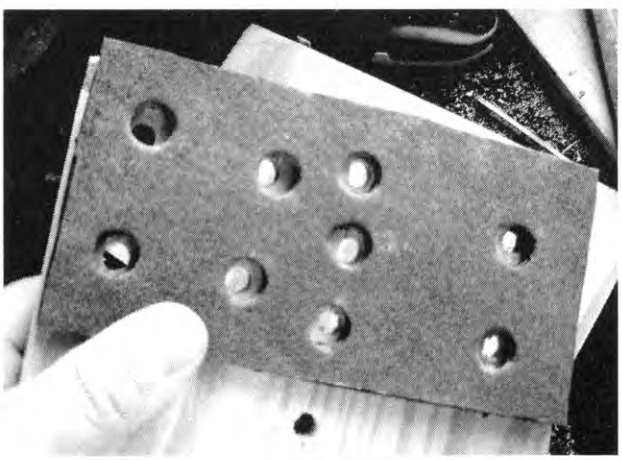
And when you remove the board:



The chalk or baby powder marks the places for the holes.

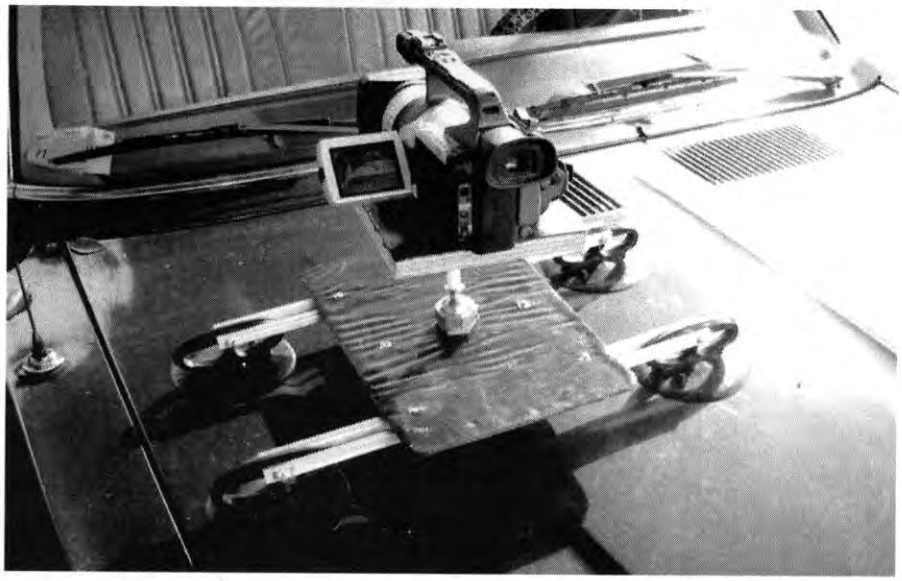


And there it is.



Clean off the powder and glue it to the board and you're done.

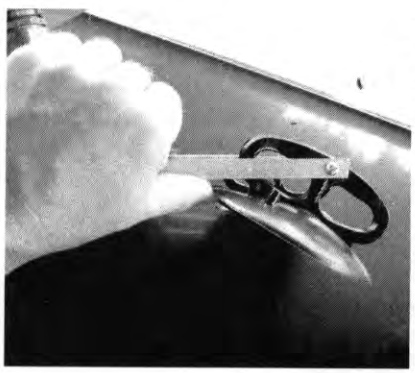
Mounting the They Drive By Night Car Mount



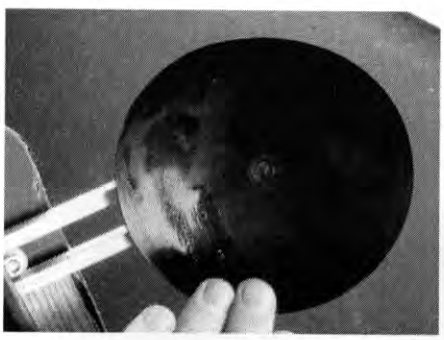
Pay close attention to the mounting instructions and follow them! I'm fairly certain the last thing you want to see is your very costly camera go flying under the wheels of a cement truck.

Even though I tested this mount with only the suction cups holding it on (even after a couple of hours, they held tight) it's important to have a back-up and strap the camera down.

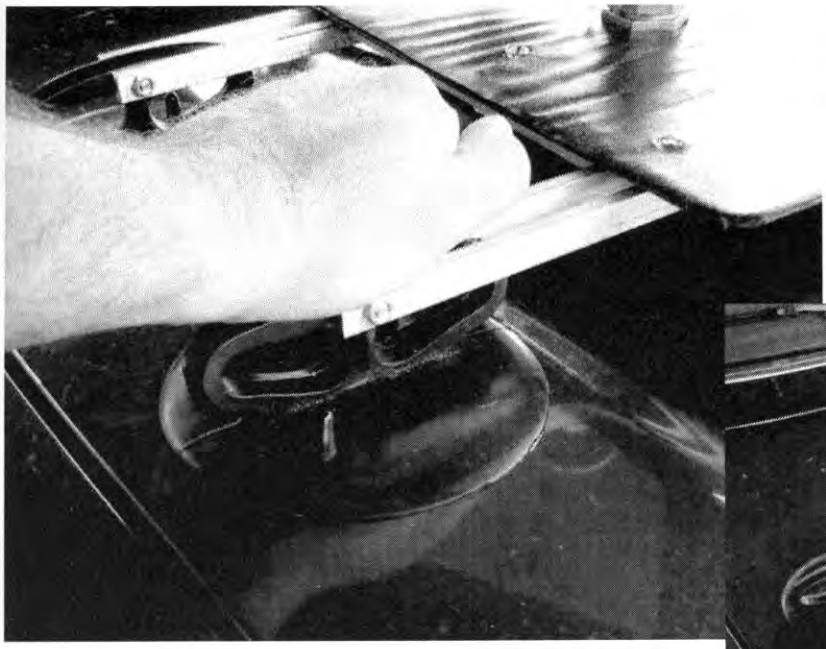




Before sticking the suction cups to your car, loosen the nuts on the cups so that they can move back and forth. This allows the cup to conform to the angles of the car.

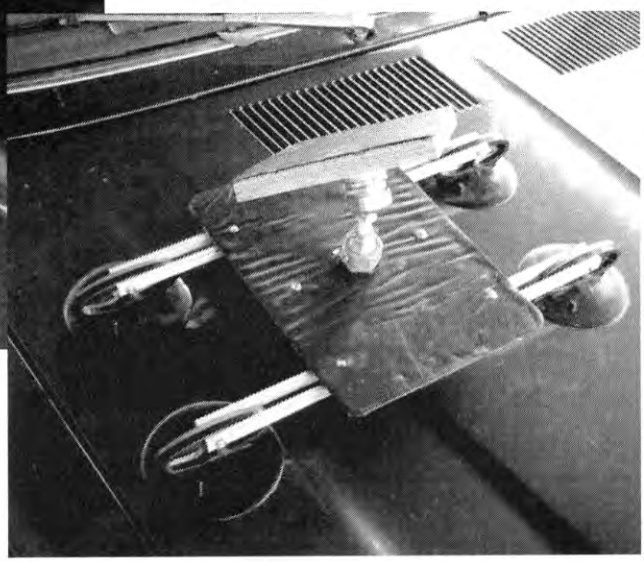


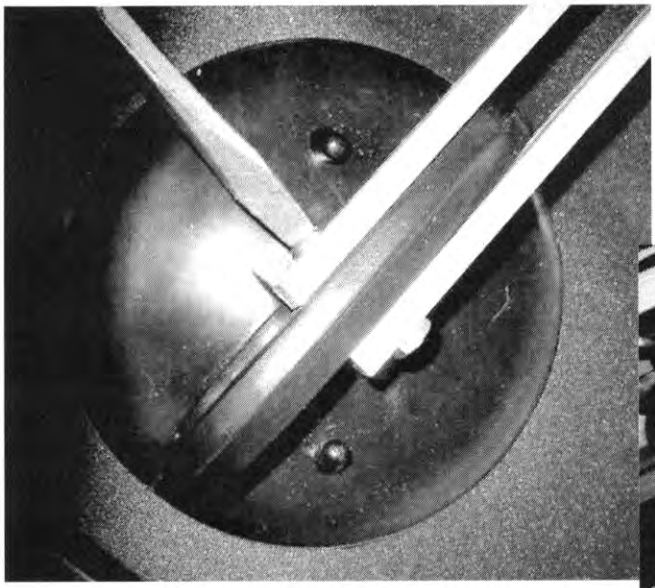
Like every other suction cup you've used, adding some spit to the edge of the cup will keep it where you stick it. Make darn sure the car is clean. If there is a lot of dirt, the suction cups won't hold.



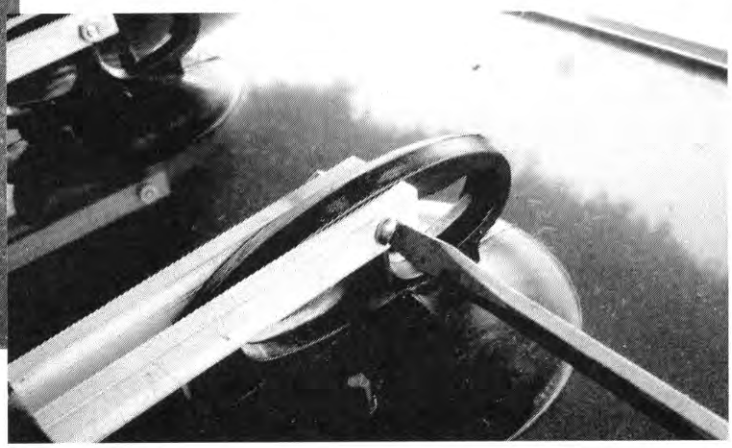
Push each cup down firmly, forcing out the air for a good grip.

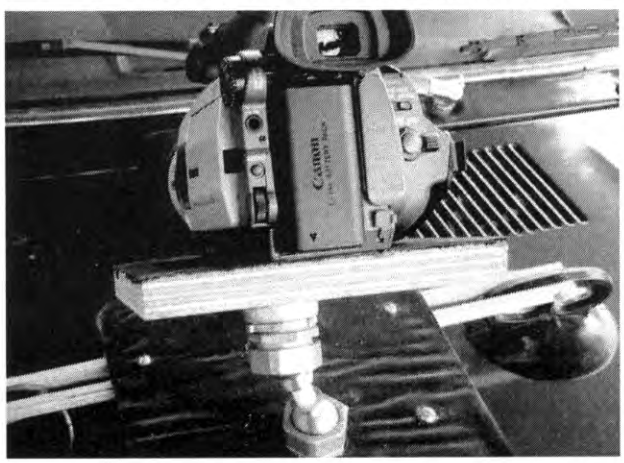
Make sure the cup rests on a flat spot!



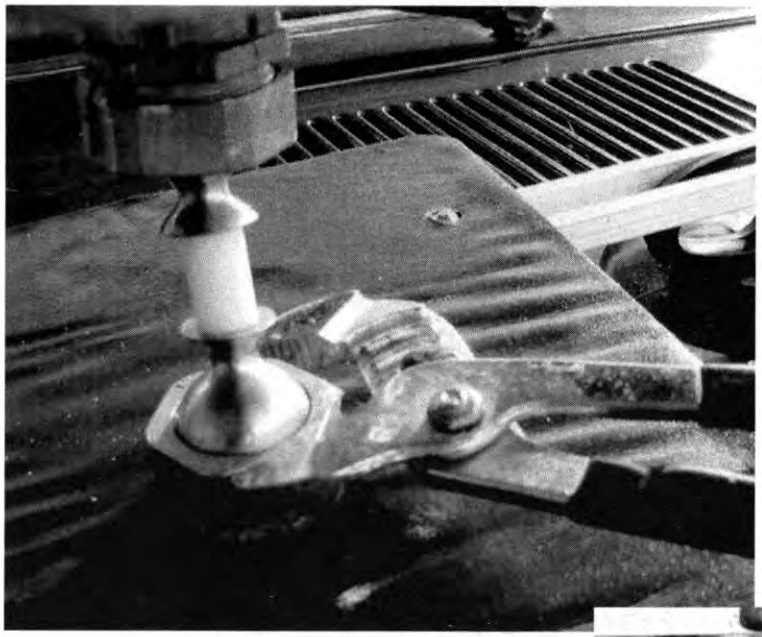


Once you have a good grip, tighten down each bolt that holds the cup to the bars.



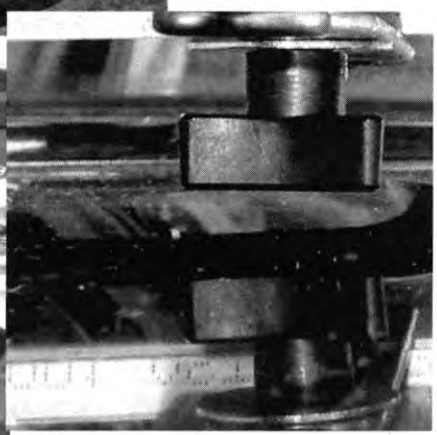


Mount the camera to the tray with a camera screw--usually a 1/4". You need one long enough to reach through the 3/4" plywood and hold the camera tight with no play.

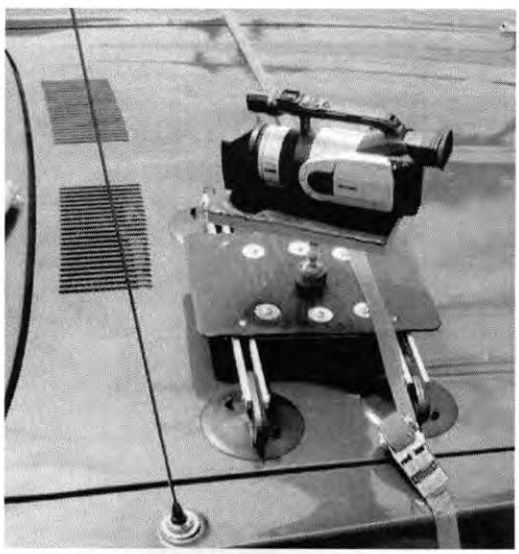


Loosen up the compression couplings and adjust the camera to the angle you want it, then tighten them down tight with a wrench.

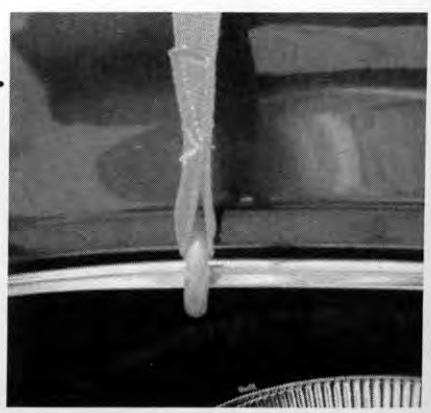




If you look underneath the mount, you'll see that you have very little room between the threaded knob and the surface of the car. This is why you need to buy knobs as short as you can.

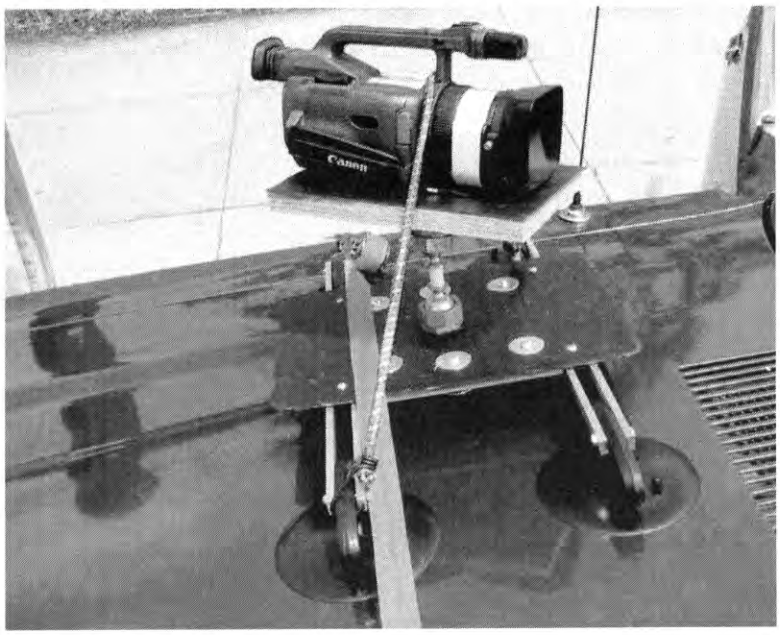


Even though I've never had a problem with the cups coming loose, why tempt fate. Use at least one strap across the base. I'm using a strap with a ratchet for tightening and coated hooks on each end. In this case I've hooked the ends onto the fender above the wheel.





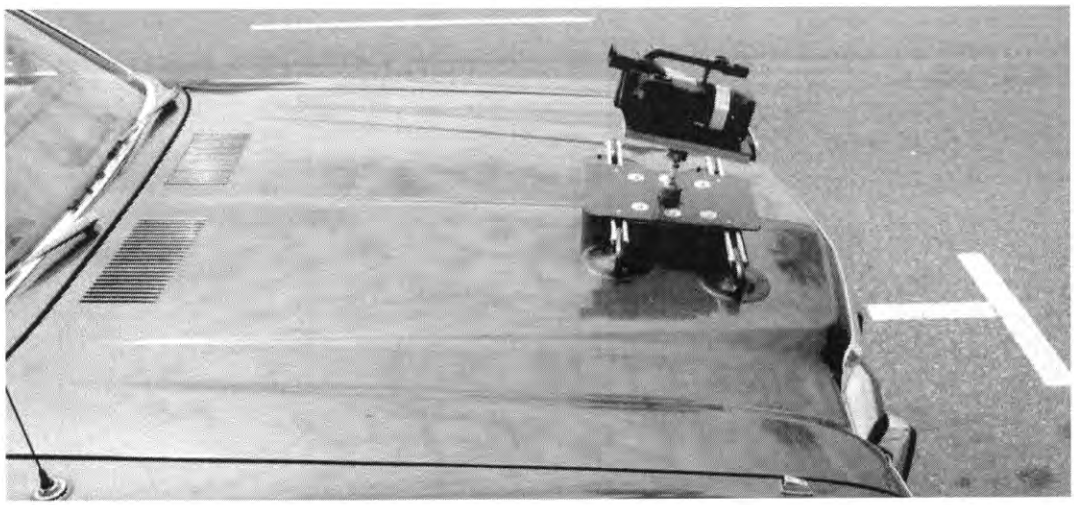
I'm also using a bungee cord across the top of the camera and hooking each end onto the aluminum bars.



And that's the basic mounting. Use your head with this rig because it is potentially very dangerous. Don't block the driver's view, stick to side streets, and go slow.

WARNING! DO NOT GO FLYING DOWN THE STREET WITH THIS ON THE OUTSIDE OF YOUR CAR! Maximum speed is 35 MPH. 25 MPH or slower is recommended.

Here are some other places I've mounted this rig:



Looking forward on the hood

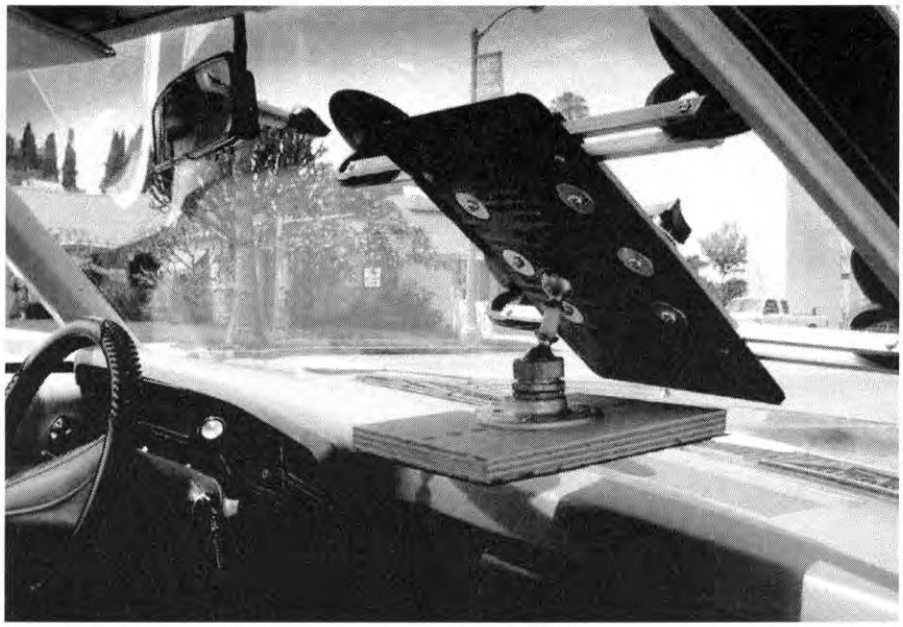


Looking backward on the trunk



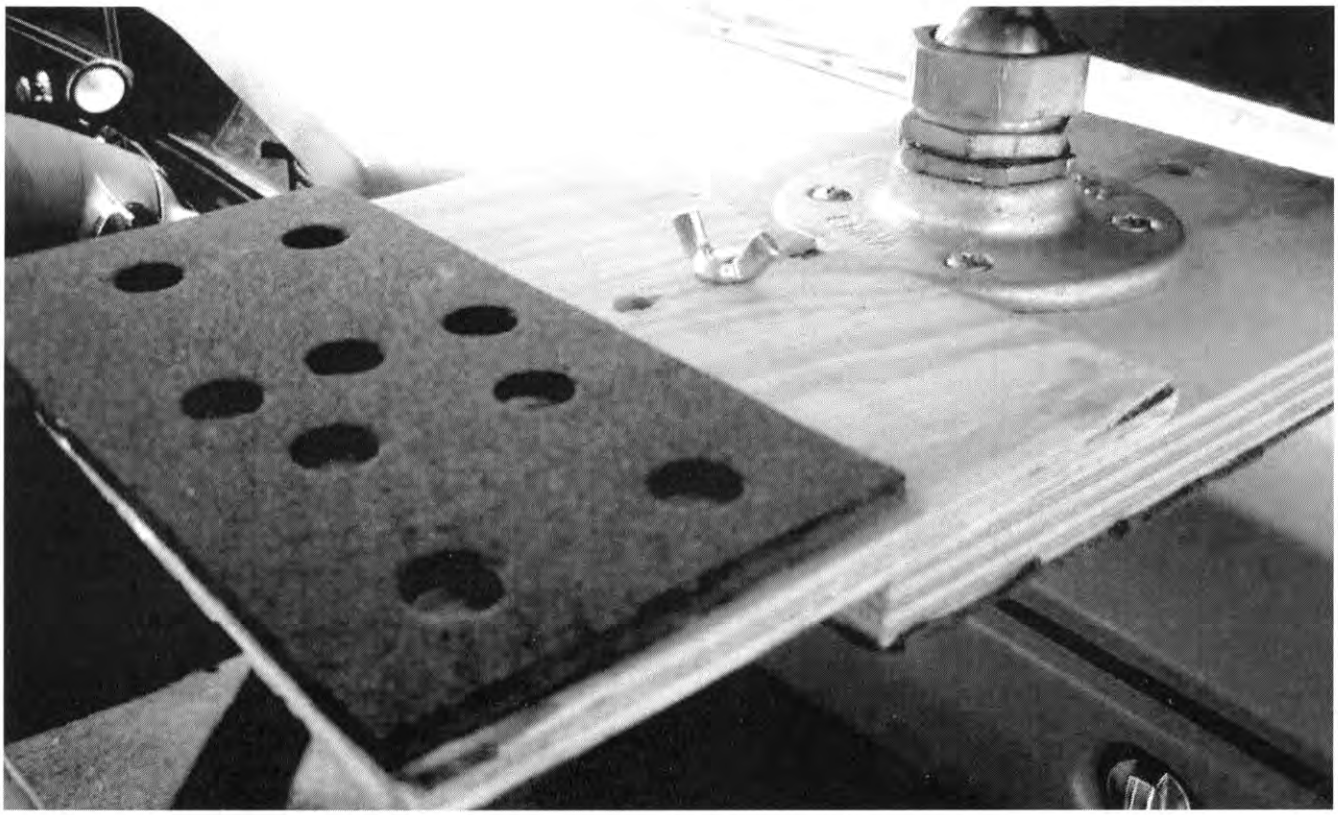
Looking through the back window

Mounting on the car Interior



This is where the extension tray comes in to play.

In this photo, the mount is rigged to the inside of the front windshield.



Take the extension tray and bolt it to the mount tray.



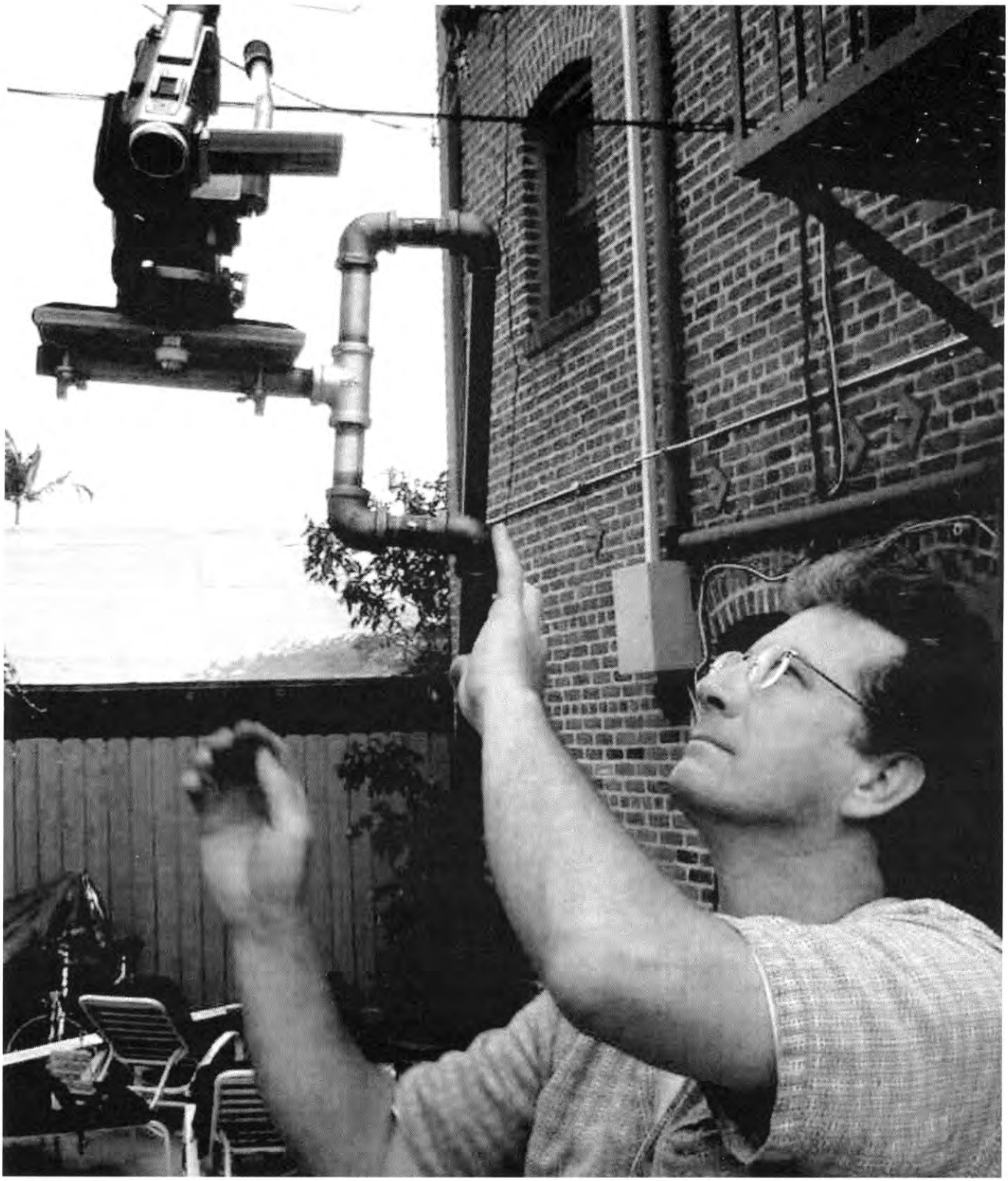
Screw the camera onto the extension tray and adjust the ball and socket joint.





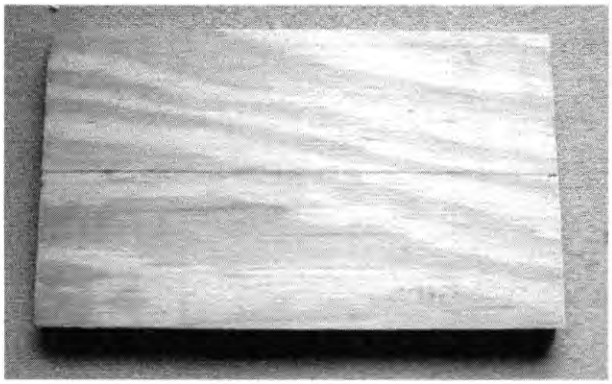
Here it is mounted on the back window looking forward.

THE KILLERS KISS CRANE

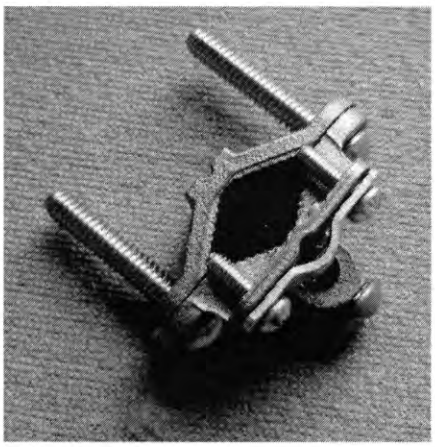


This Crane is made out of plumbing pipe and is super fast and easy to make. It's a perfect compliment to the Dark Passage Dolly.

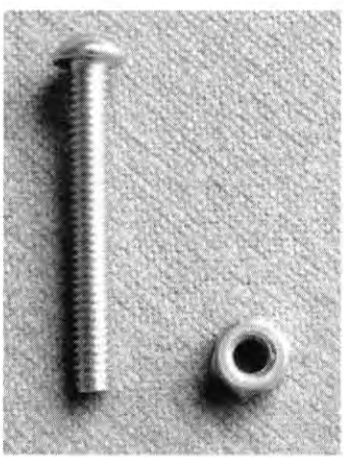
MATERIALS LIST FOR THE KILLERS KISS CRANE



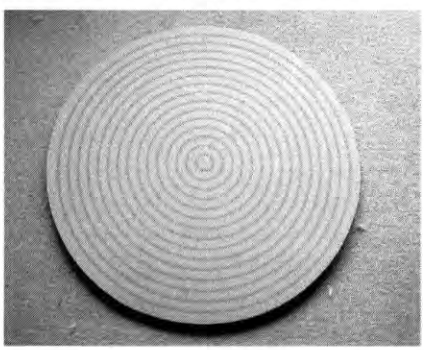
1/2" to 3/4" thick piece of plywood around 7 by 9 inches.



(2) 3/4" to 1" grounding clamps. You'll find these in the electrical department. The bolt below replaces the bolts that come with the clamp-- make sure you find ones that fit.



(4) 1 3/4" long bolt with nut. These bolts replace the bolts that are in the grounding clamp above.
I'm using a half inch piece of plywood for the camera base. If you're using a 3/4" thick plywood, add 1/4" to the length of this bolt.



Mouse pad or cork.



Acetone. The pipes you'll be buying are covered in oil and grease. It's a really good idea to clean them with a little acetone--especially if you plan on painting the crane later.



Glue.



Rubber gloves. Use these when cleaning with the acetone.

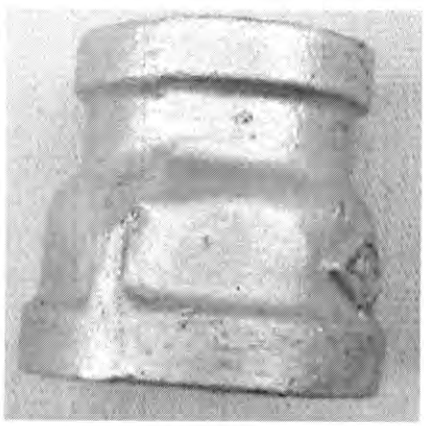


Chalk or baby powder (if you're using a mouse pad).

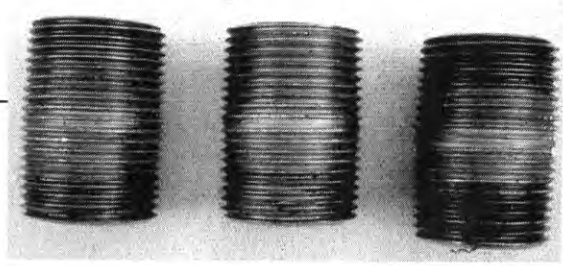
About the plumbing pipe used on this crane: it doesn't matter whether you get the black or galvanized stuff, just make sure it has threads on each end.



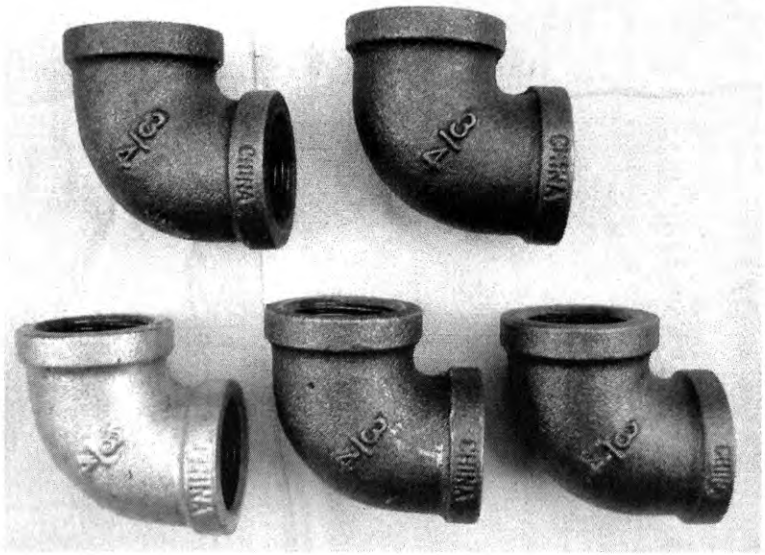
1" plumbing pipe by 36" long. (This is only if you're going to mount the crane on the dolly in this book.) Get a 12" long pipe for tripod mounting.



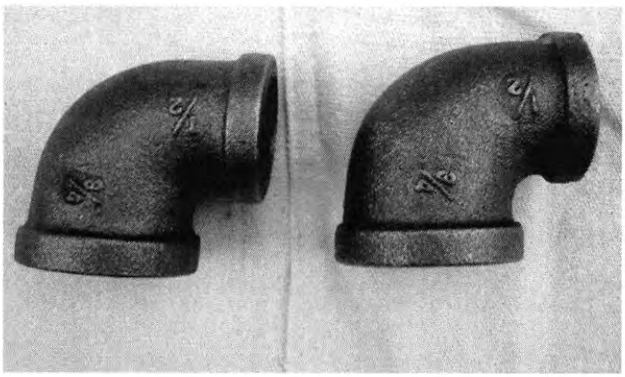
1" to 3/4" reducing adapter.



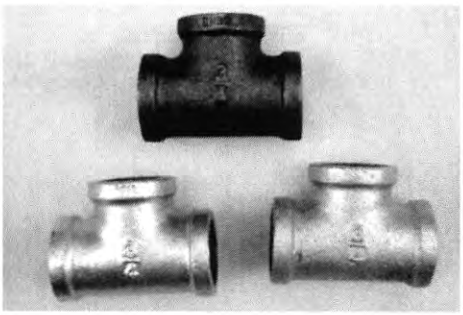
(3) 3/4" long by 3/4" diameter Nipples.



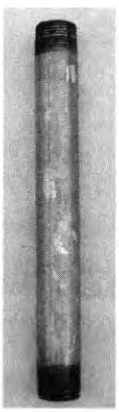
(5) 3/4" Elbows.



(2) 3/4" to 1/2" reducing Elbows.



(3) 3/4" T-fittings



9" by 3/4" nipple



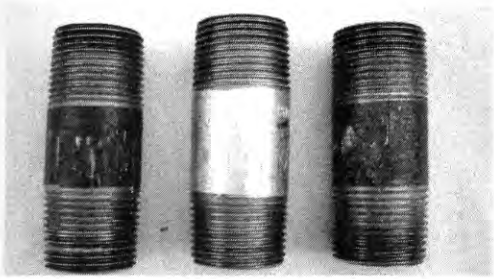
8" by 3/4" nipple



6" by 3/4" nipple



3 1/2" by 3/4" nipple



(3) 2 1/2" long by 3/4" diameter Nipples.

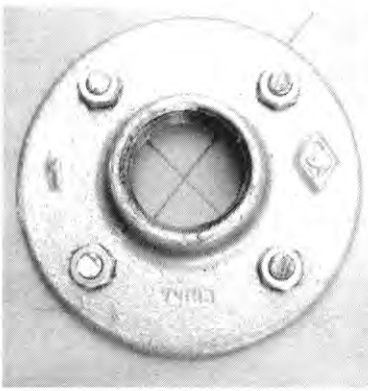


48" long by 3/4" pipe.

48" long by 1/2" pipe.



30" long by 3/4" pipe.



1" floor flange. If you're going to use this on the dolly. Pick up four 1/4" bolts with nuts about an 1 1/2" long if your dolly board is 3/4" thick.



An assortment of weights. These are dirt cheap at any sporting goods shop. It's better to get four 2.5 pound weights than one 10 pound. Just mix and match. If you have weights for the larger cranes, you're done, because this crane doesn't need nearly as much weight.



A conduit hanger. Just one. Get one for 1/2" or 3/4" conduit. This is in the electrical department.

TOOLS LIST FOR THE KILLERS KISS CRANE



Drill. ☐



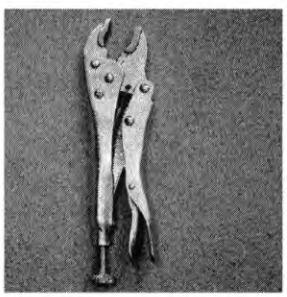
Utility knife or scissors. ☐



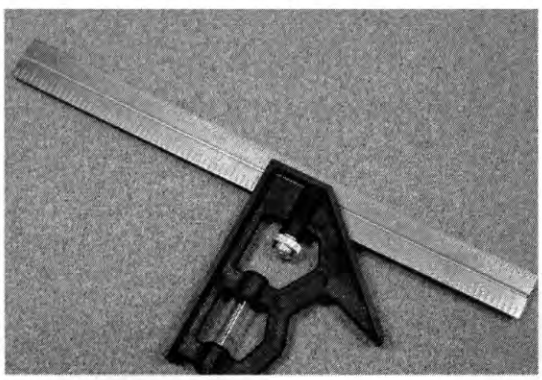
5/16" drill bit
1/4" drill bit. ☐



Screw Driver. ☐



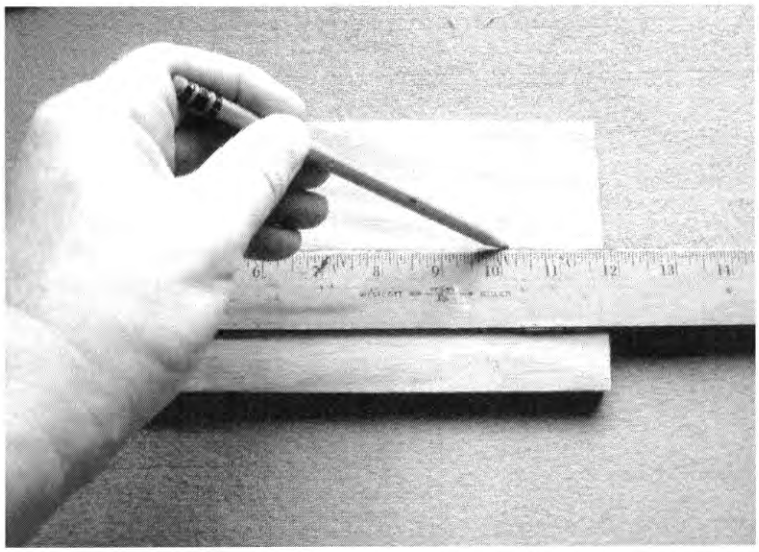
Channel locks or vice grip pliers. ☐



Combination square. ☐

Let's Build it!

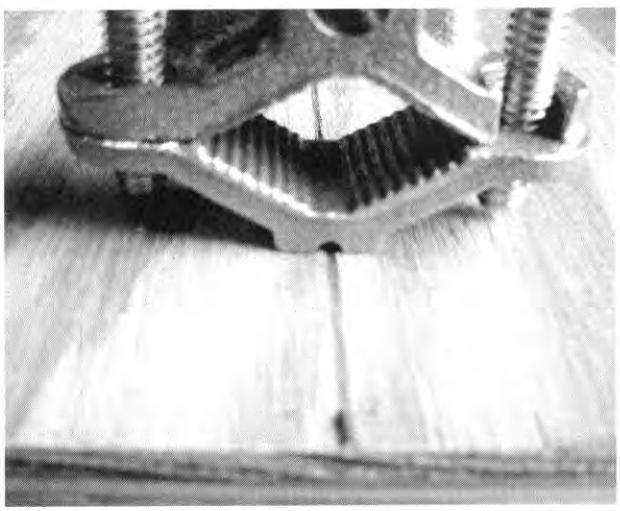
1. The Camera Mount

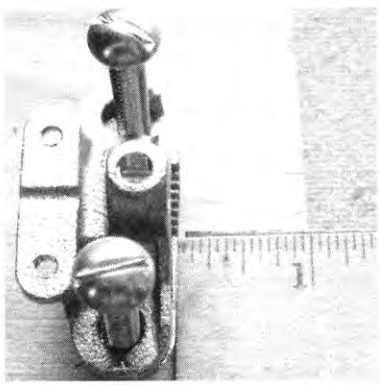


Draw a line down the middle of the length of the plywood.

2.

Center the grounding clamp on that line, about 1" in from the edge of the plywood.



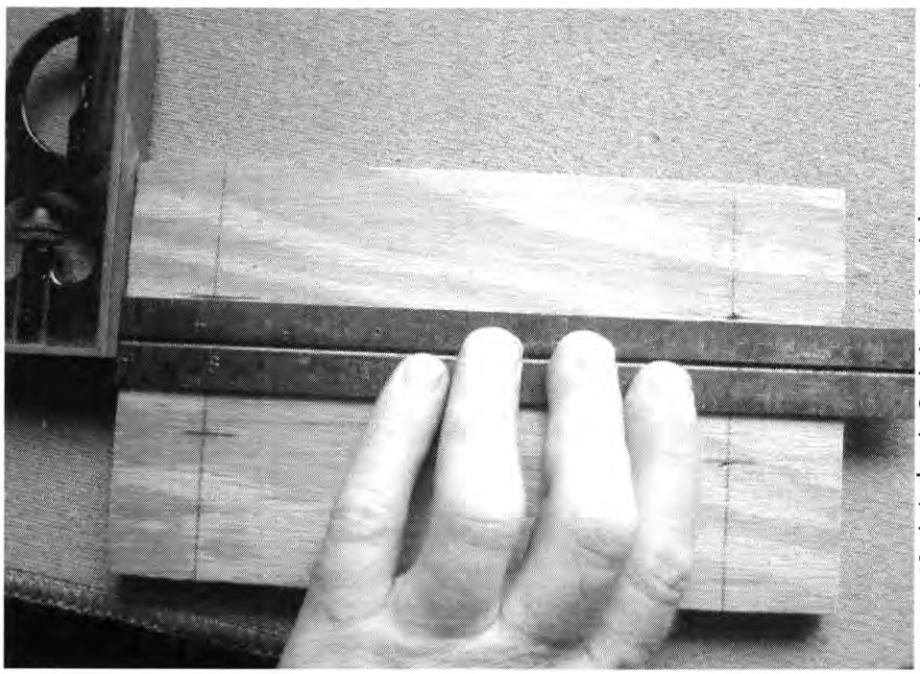


Mark where the bolts meet the plywood on each side of the line.

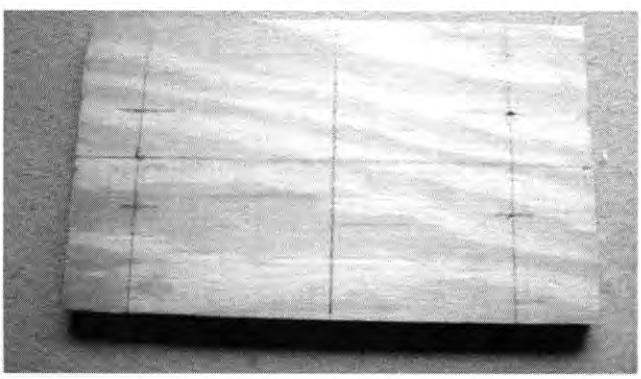


3. At the one inch mark from each end, use your combination square to draw a line across the narrow width of the board.

4. Adjust your combination square to run down the length of the plywood. Line the straight edge up with the mark you made where the grounding clamp bolt met the wood.



Draw a mark at the opposite end across the line that you made across the narrow side of the board. Do this on the other bolt mark as well.
You should now have 4 marks: 2 on each end 1" from the edge. This is where we will drill holes to hold the grounding clamps.

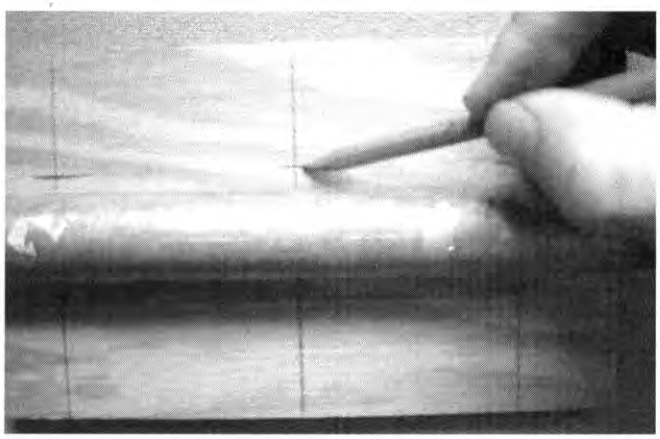


5. Now use your combination square to draw a line across the narrow width of the board at the half way point.

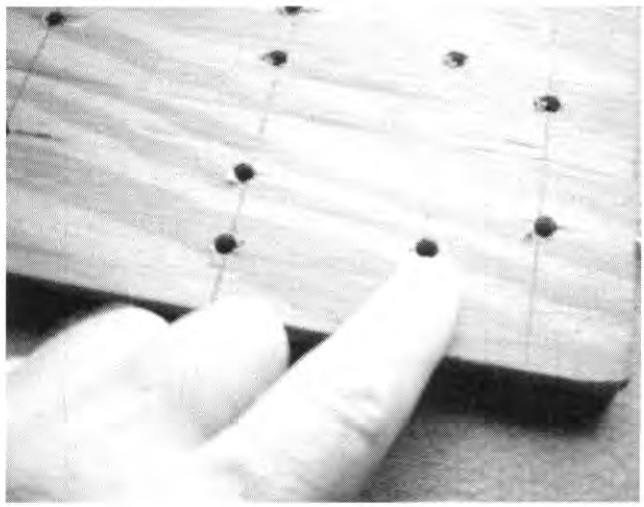


Take your 9" pipe and lay it on the center line.

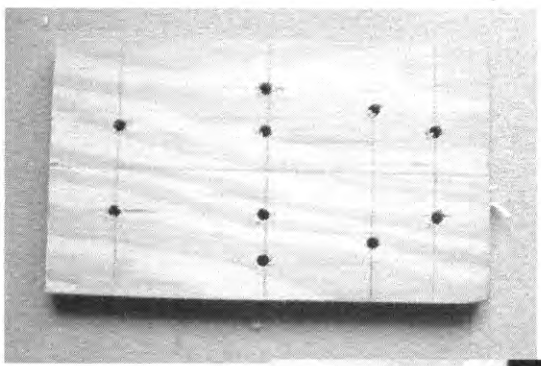
6. Holes for the Camera Bolt



On each side of the pipe, make a couple of marks on the center line. These are for the camera bolts to hold the camera to the platform.



Here's the camera mount with the holes drilled. As you can see, I added some more holes for more latitude for camera placement.

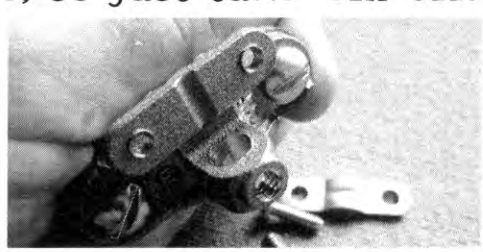


You can put as many camera mount holes as you want. Take your 1/4" to 5/16" bit and drill away.
You can use this bit to drill the holes for the grounding clamps as well.

7.

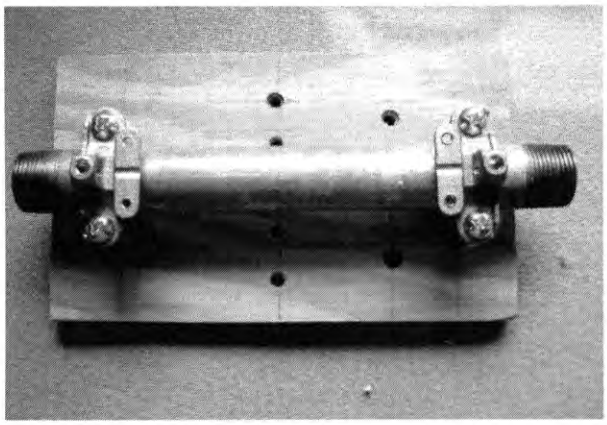


Look on top of your grounding clamps. There are a couple of little screws holding a little clamp. You don't need these, so just take 'em off.

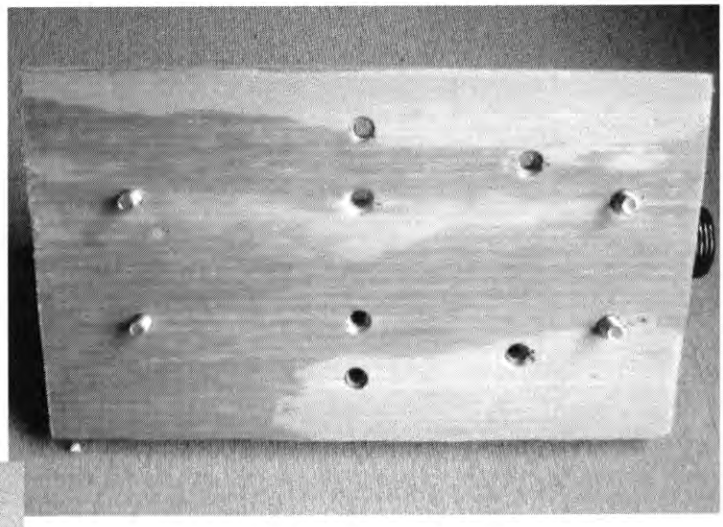


8.

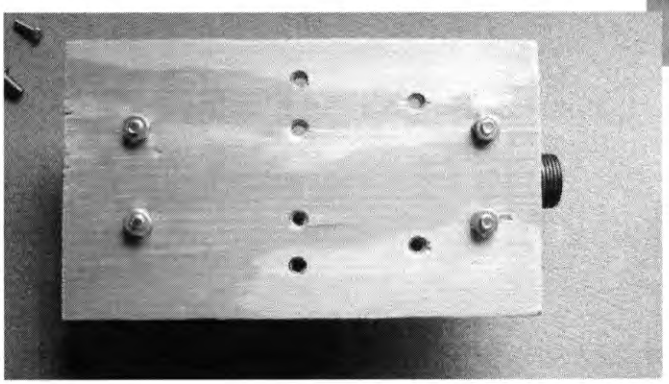
Take out the bolts that came with the grounding clamp and replace them with the longer ones.



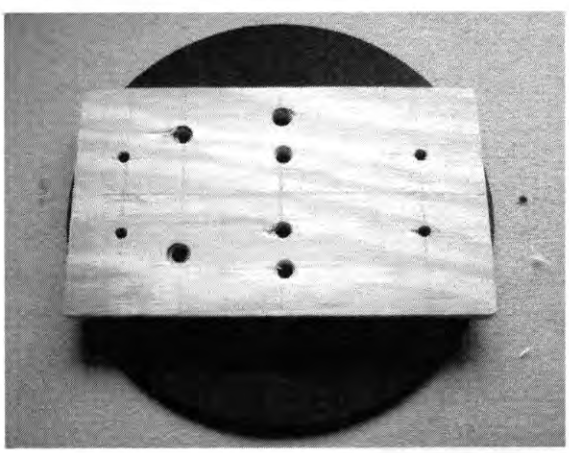
Attach the grounding clamps and run the 3/4" pipe through them...



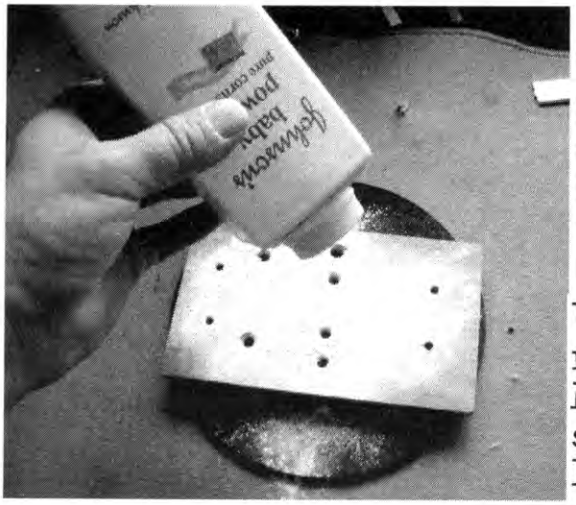
...flip the plate over and add nuts to the bolts. Make sure the bolts don't go too far beyond the top of the nut. If they do, hacksaw them off.



9.

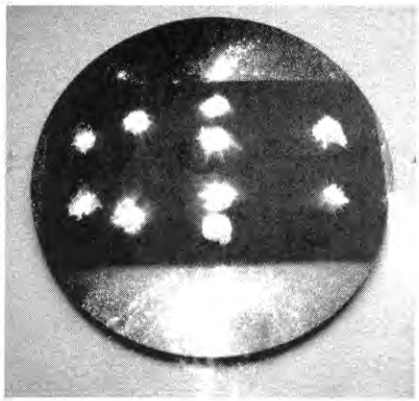


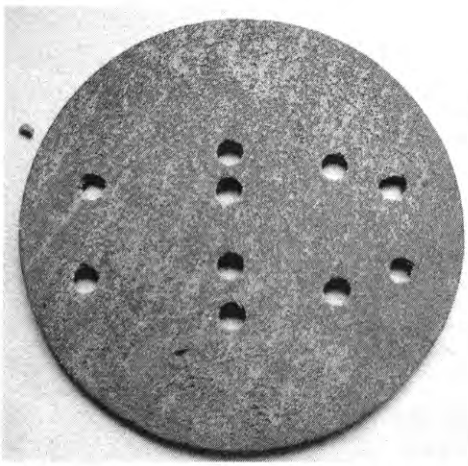
Take all the hardware off your camera plate. If you're using a mouse pad, rip the cover off it. Center the board on your mouse pad or cork and mark where the holes are.



A good way to mark the holes if you're using a mouse pad is to sprinkle some baby powder or chalk into the holes.

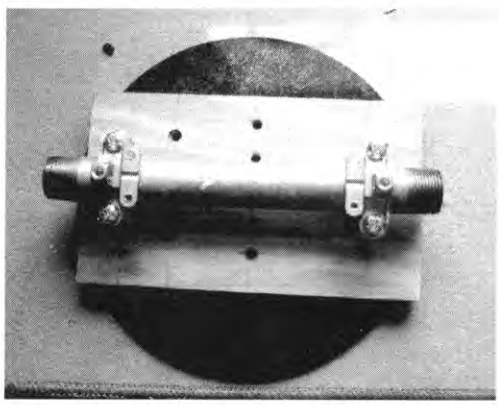
When you remove the board the powder shows all of your holes.

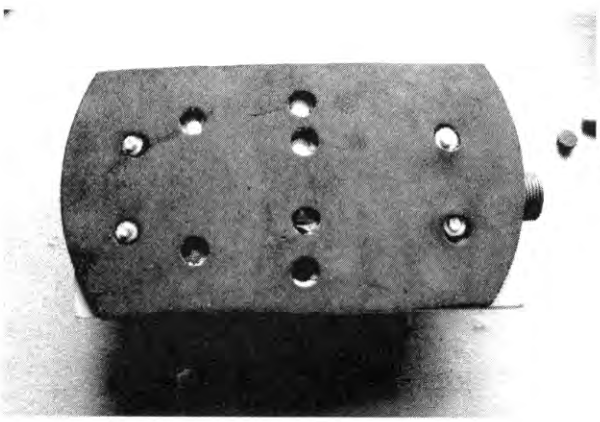




Then just cut out the holes. I used a fabric punch that comes with a grommet kit to get these nice round holes. If you're going to make the "Touch of Evil" cam, you'll need a grommet kit anyway.

Spread some glue on the board, line up the holes, weight the thing down and let it dry.





Once it's dry, trim off the excess pad and you're done.

Now for the crane part.

Like the other cranes in this book, the Killer's Kiss Crane screws into a flange at its base. I'd like to encourage you to try this on the Dark Passage Dolly. Just bolt the flange to the center of your dolly platform and you're good to go. If you want to mount this crane to a tripod, follow the mounting instructions under "The Big Combo Crane".



Before you start putting this together, take an old rag with a bit of acetone on it and clean all the pipe parts. Make sure to wear gloves!



If you're using your dolly platform, take the wheels off or keep them from rolling somehow.

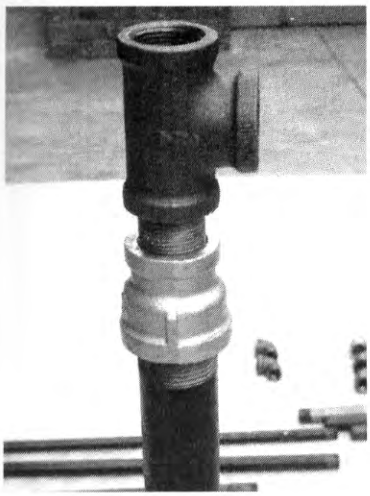
Take the 36" long by 1" pipe and screw it into the flange.

Grab the 1" to 3/4" reduction fitting and screw that on to the 1" pipe.

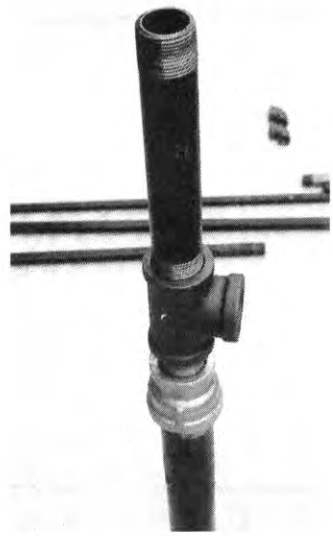




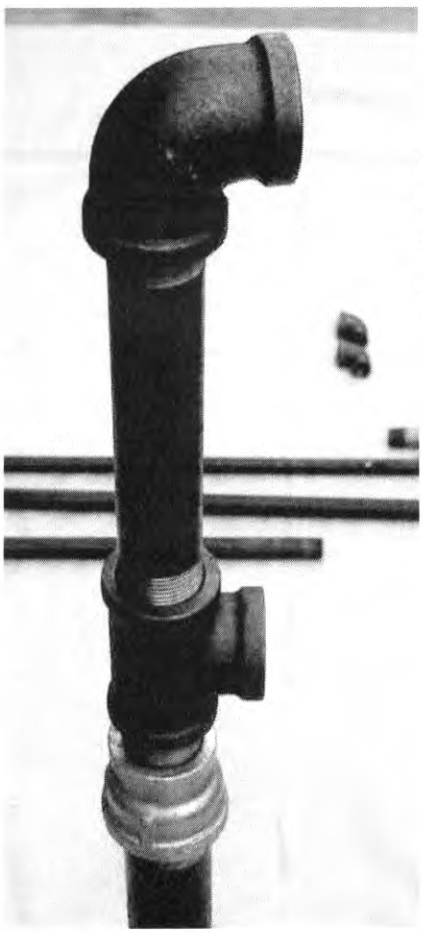
Then screw a 3/4" long nipple into that...



Screw a T-fitting onto the nipple as shown.



Screw the 8" long pipe into the top of the T-fitting.



Then screw an elbow onto that. Make sure the opening on the elbow and the T below are pointing the same direction.



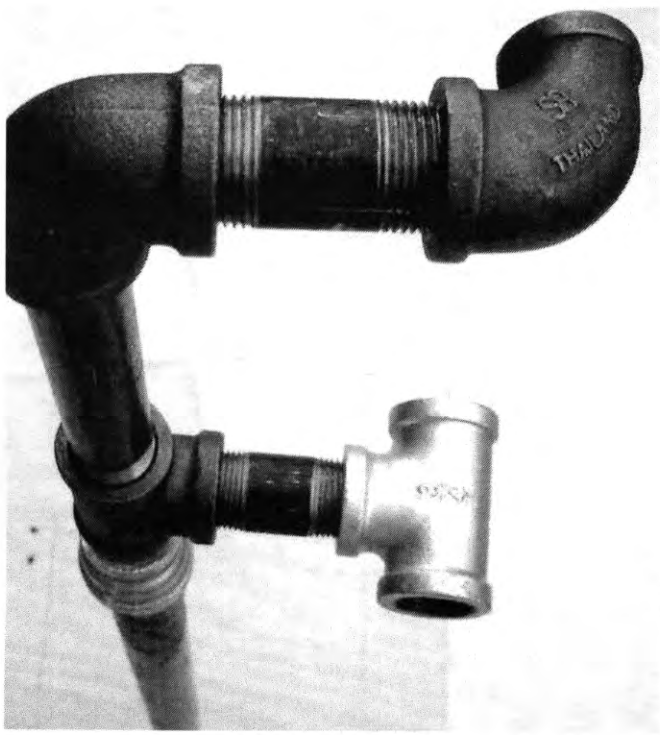
Screw a 2 1/2" nipple into the elbow.

Screw another 2.5" nipple into the T.

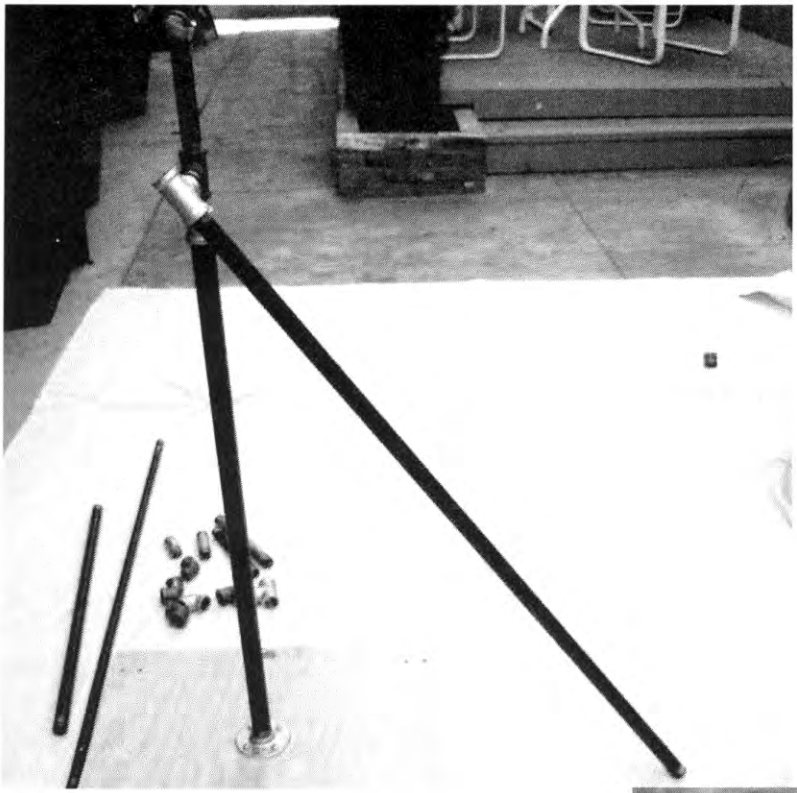


Screw one of the 3/4" to 1/2" reducing elbows onto the top nipple.





Screw one of the T's onto the bottom nipple as shown.



Screw on the 1/2" by 48" long pipe into the top elbow.





Take the second 1/2" to 3/4" elbow and screw it to the top 1/2" bar.

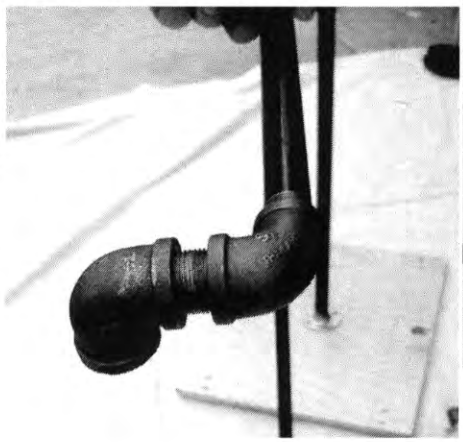


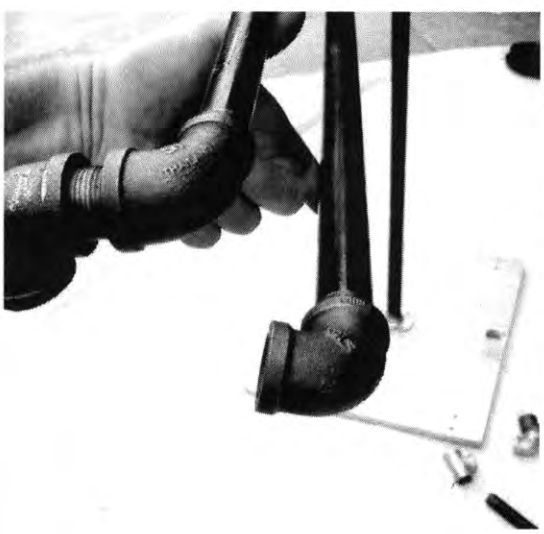
Add a 3/4" long nipple to that elbow.

Add an elbow to that nipple. Are all of your bits pointed the same direction as mine?



Here's a front view.

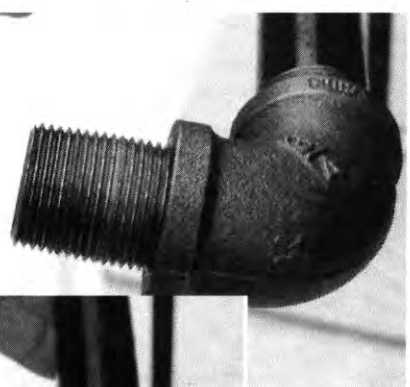




...then another elbow pointing up.

Add an elbow to the bottom pipe...

...then another 3/4" nipple...



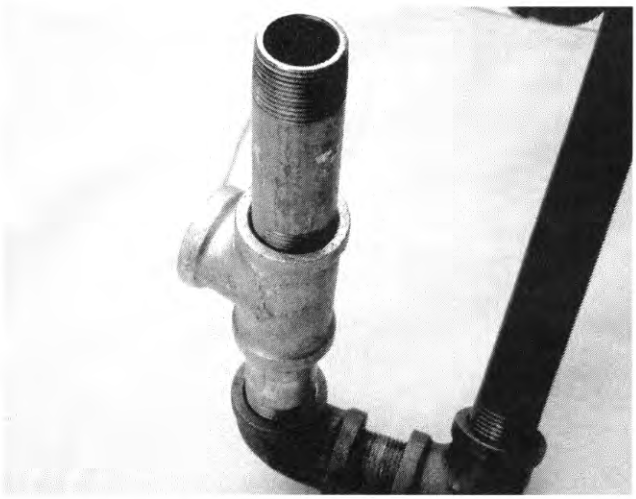




Grab another 2 1/2" nipple and screw it into the bottom elbow.



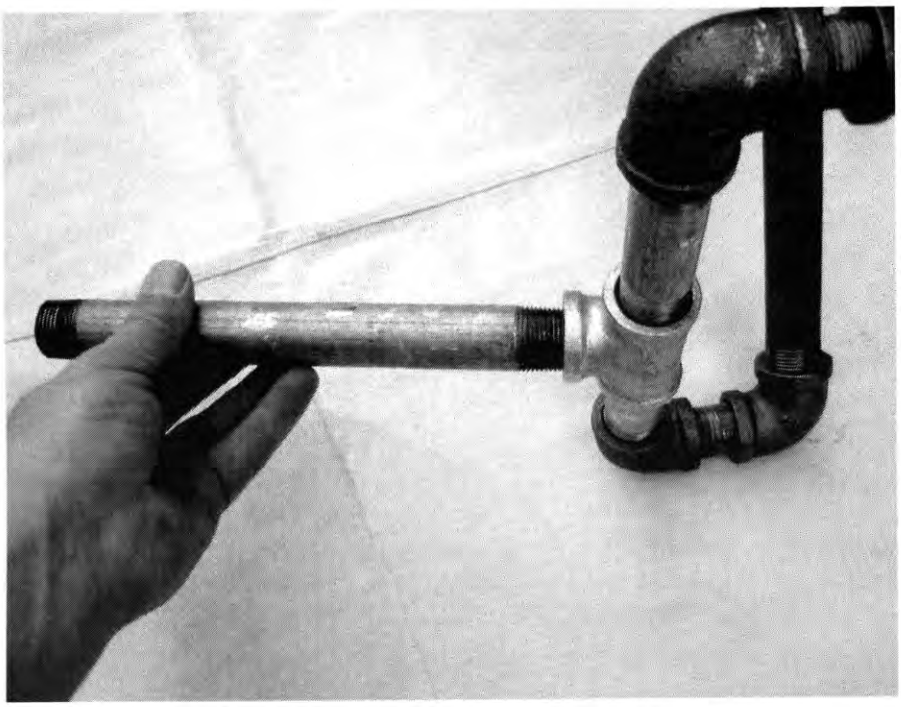
Add a T fitting.



Put the 3 1/2" nipple into that.



Then screw the 3.5" bit into the top elbow. This can get a little tricky. The idea is to screw everything below the top elbow as far down as you can, then screw up into the top elbow. You obviously won't have everything super tight in this section since each piece gives up a little of its thread to screw into the top elbow.



Screw the 9" nipple into the T.

If you left the camera plate on the pipe, that's just fine. Screw the whole thing on.

Take the 30" pipe and screw it tightly into the T coming off the center column.

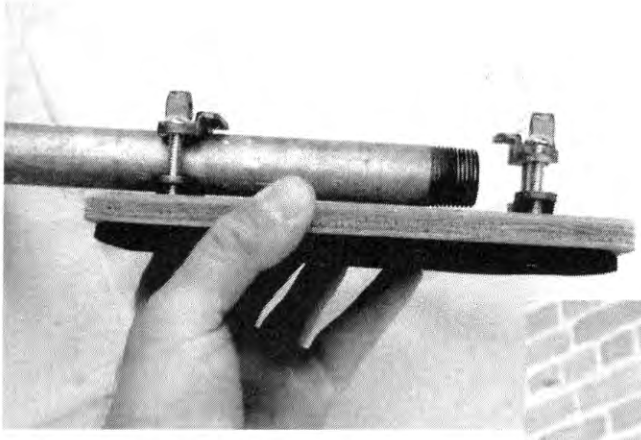




Add an elbow onto the end of that. Make sure it's super tight and pointing up.



Add the 6" pipe into that.



Slip on the camera mount and tighten down the clamps.

Slide the weights on the other end...



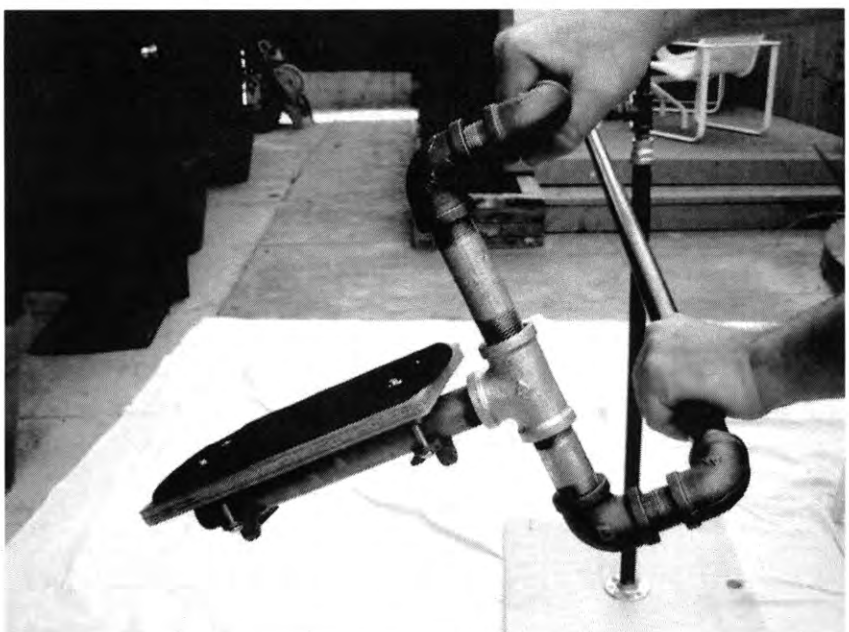


...then add a conduit hanger over that and tighten that bolt on the hanger.

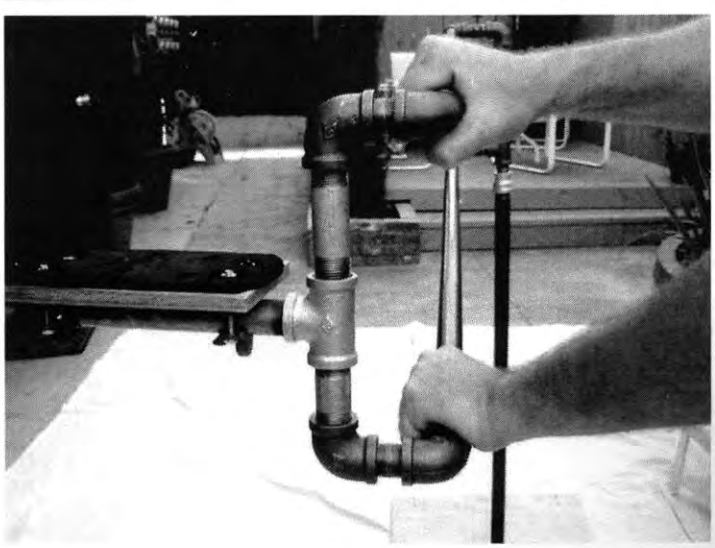
Because of the swell design, you'll be tempted not to use a conduit hanger. Don't be a squid! If those weights come off, the camera goes crashing. You gettin' the picture?



Since everything is connected by threads, you might find that the crane is out of whack. I've greatly exaggerated the "out of whackness" to get the point across.

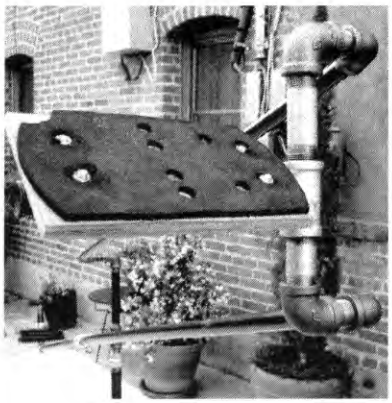
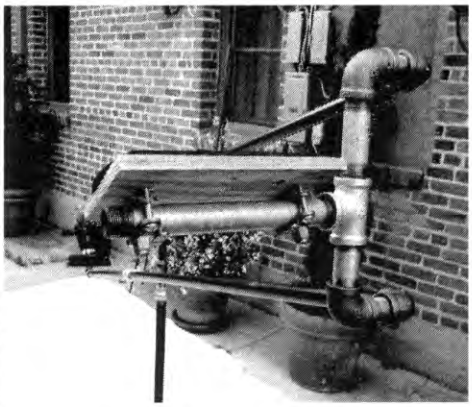


Simply grab the top and bottom arms...



...and push the bottom away from you and pull the top toward you until the camera platform is level.

ATTENTION! Take a look at every place the crane pivots on the threads...got it? OK, everything else has to be superman tight, or the crane will fold in on itself. This may require you taking it apart to retighten some of the bits and pieces.

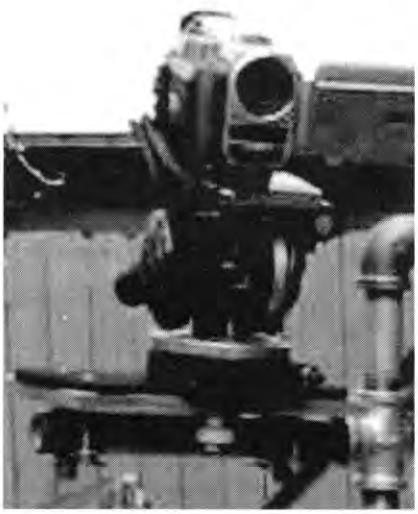




One of the great advantages of this crane is that you can tilt the camera bracket on the threads of the pipe and it will stay at that angle throughout the move.





Or you can go along the horizontal axis...



...or, like all the cranes in this book, you can attach a fluid head.



WORKING WITH A CRANE

What I'm about to tell you is common sense. Unfortunately, for some strange reason, people lose their common sense on a film set. I see it time and time again. So here are a few rules to use ALWAYS.

1. Keep your tripod legs at the widest possible spread. Of course you'll have to balance safety and the needs of the shot.

2. Always weigh down the tripod legs-- sandbags are perfect.

3. Make sure the tripod is level before you attach the crane.

4. Make sure the camera end is sitting on the ground and weighted before adding or removing (especially removing!) weights.

5. When blocking the shot, take the crane through its movements slowly and look for any potential hazard. I've seen the weight end of a crane crash through a window, and the camera end bonk an actor.

6. Cranes do take practice. Not nearly as much as the Stabilizer, but I'd really recommend trying some moves before the shoot day.

There ya' have it. Of course you can always ask a question at:

www.dvcamerarigs.com

THE SWEET SMELL OF SUCCESS POOPER SCOOPER CAM



This is a really simple device to make as well as to use, and can deliver some really cool ground level shots.

It basically consists of 2 aluminum tubes; one inside the other. The interior tube uses a spring to help absorb movement from the operator.

If the Shock Corridor Stabilizer seems like too big of a project for you right now, make the Sweet Smell of Success Pooper Scooper Cam. Many of the principles, parts, and building techniques are the same.

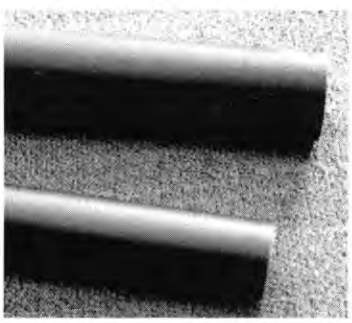
MATERIALS LIST FOR THE POOPER SCOOPER CAM



(1) 5/16" threaded rod by 6 inches. Threaded rod is just a big bolt with the head cut off. I've never seen a hardware store that didn't have these.



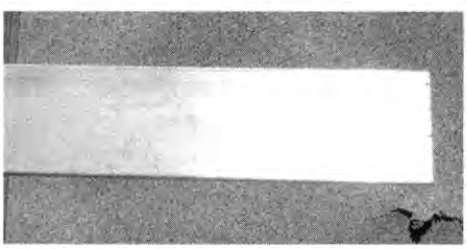
(1) 5/16" lock nuts for the threaded rod. Lock nuts have a nylon ring that holds it tight to the bolt. (You might also see these called "Stop nuts").



Aluminum tubing. There are a couple different types of tubing you can get. Regular 'ol aluminum tube or anodized aluminum. The anodized stuff comes in an assortment of colors and is pretty hip. You'll need (1) 1 1/4" O.D. (Outside Diameter) and (1) 1" O.D.. The color ones usually come in 6' lengths, so you won't use the entire lengths of these, but you can use what's left over for other projects.

1 1/4 inch od

1 inch od



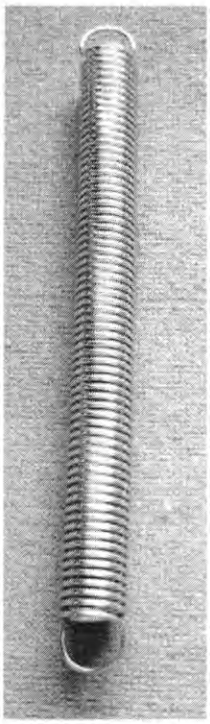
Aluminum Bar. 1 1/2 inches wide by about 25" long. Just get 3' and we'll cut it to the proper length later.



A tube of epoxy.



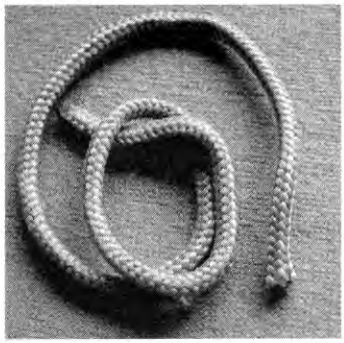
(2) 7/8" plastic sockets. These come in packs of 4 and are used to shove into metal chair legs to hold wheels. I'm using "Shepards" brand. You might need a larger socket on a different brand.



A spring. Somewhere around:

9/16 x 4 x 047

If your camera is over 1.5 pounds, go with a stiffer spring.



A bit of cord. 12" is more than enough.



(1) plastic leg tip for 1" tube.

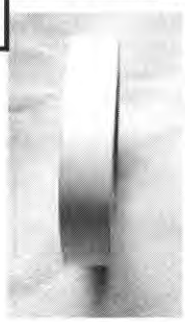


A nylon spacer. If you're using the same diameter tubing as mine, this needs to be 1" long

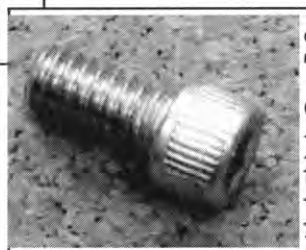




A bolt that is 1 1/2" long with a nut. This has to be able to fit through the above spacer. See photo above at right.

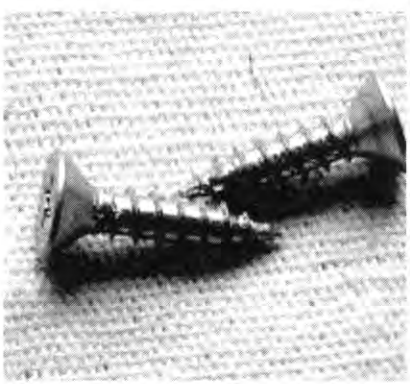


Camera tape, Gaffer's tape or duct tape.



camera bolt
This holds the camera to the platform. Usually the camera base has 1/4" thread, but yours might be metric. Just take the camera to the hardware store and get the right size. Get one 1/2" long unless you're going to use a mouse pad, then 3/4".

This is an allen head. A flat head or hex works too.



(2) small flathead wood screws, between 1/2" and 3/4"

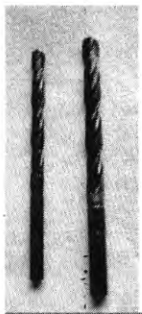
TOOLS LIST FOR THE POOPER SCOOPER CAM



Drill.



Hammer



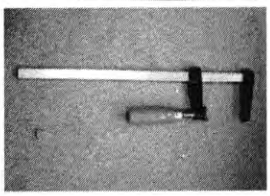
Drill bits
5/16"
1/4"



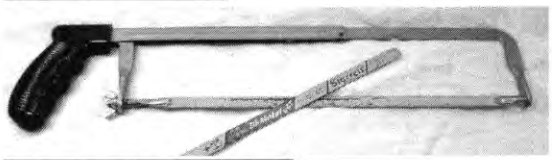
Utility Knife



cutting oil.



Clamps



Hacksaw



Tube Cutter.

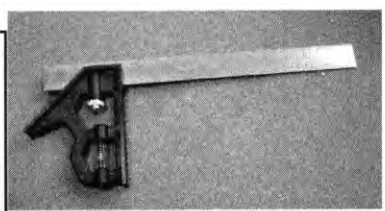
Make sure you get one big enough to go around 1 1/4" diameter pipe.



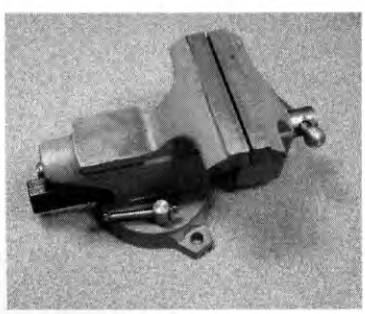
screw driver



Vice Grips



combination square



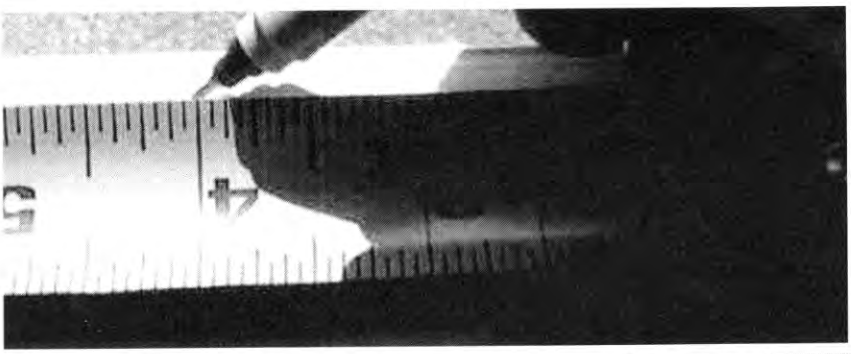
Vice



Prick punch
center punch

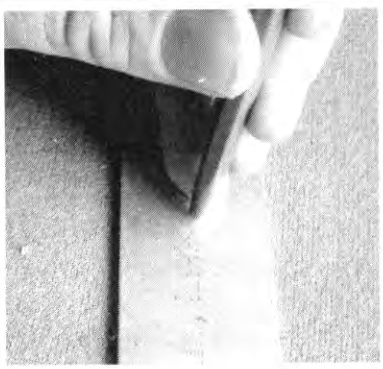
Let's Build It

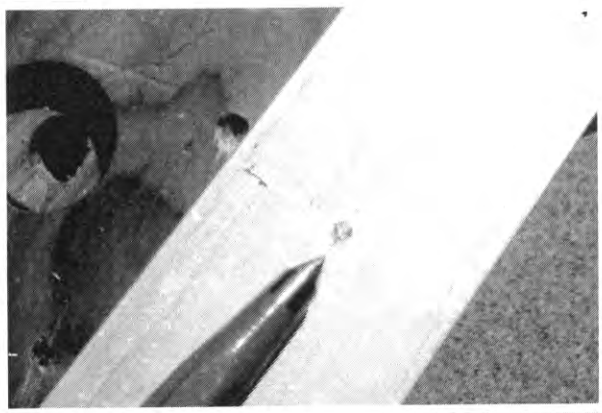
1.



Measure two inches from the end of the aluminum bar and make a mark.

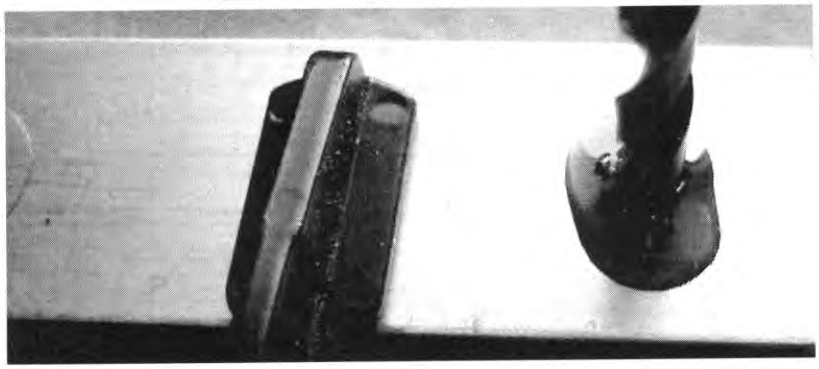
At that mark, half way across the width of the bar, use a prick punch and hammer to pound a dimple into the bar.

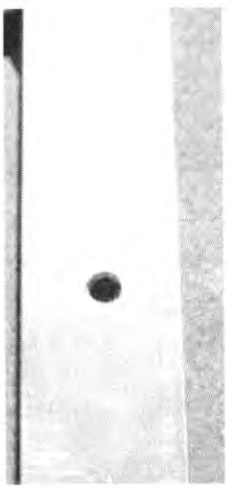




2.

Clamp the bar down to a bit of scrap lumber, add drilling oil to the dimple, and drill a 5/16" hole.



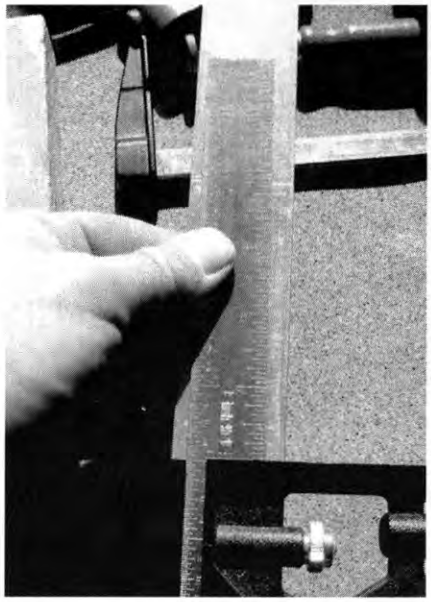


A Little Note:

I added a hole at 4" as well just to allow for future cameras I might use that wouldn't balance in the first hole. This isn't necessary, as you can add this hole at any time, or add an additional camera mount holes in the bottom.

WARNING: PLEASE READ ABOUT DRILLING METAL ON PAGE 94.

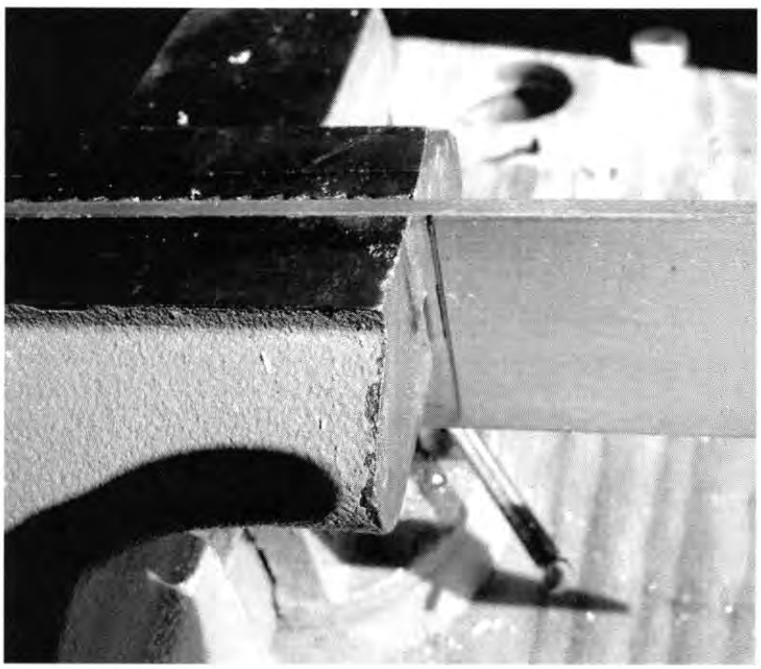
3.



Use your combination square and measure six inches from the end of your bar. This is the same end you measured from to drill the hole.

Use the prick punch to scratch a straight line across the bar at this point.

Scratch another line 14" from the same end.



4.

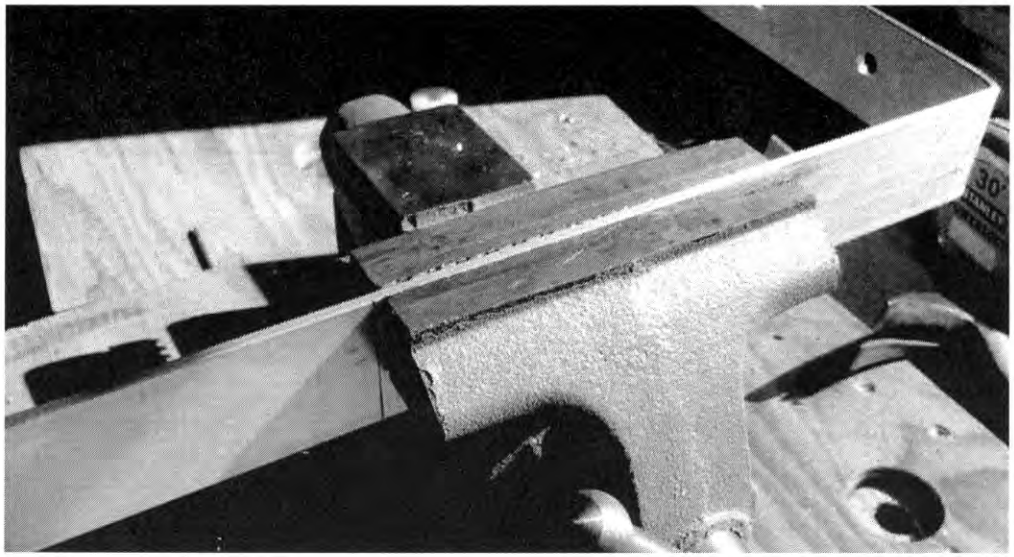
Tighten the bar into your vise at the 6" line you just made. I've given the mark about an 1/8" bit of breathing room because we are bending the bar and I want to allow for the bend.

Make sure the bar rests level in the vice. I've lined the top of the bar up with the top of the jaws of the vice to make sure of this.

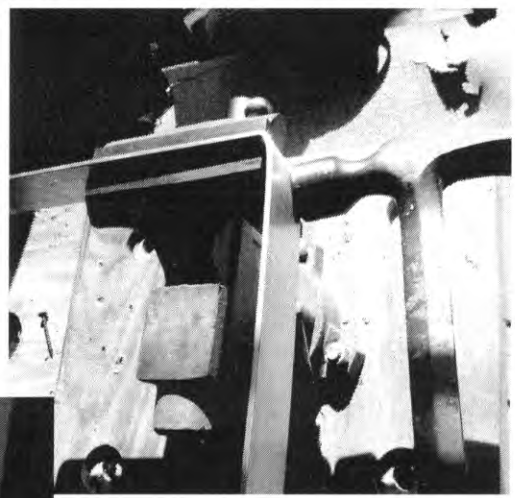
Take your hand and bend the bar to a 90 degree angle. It's not as hard as you might think.



5.

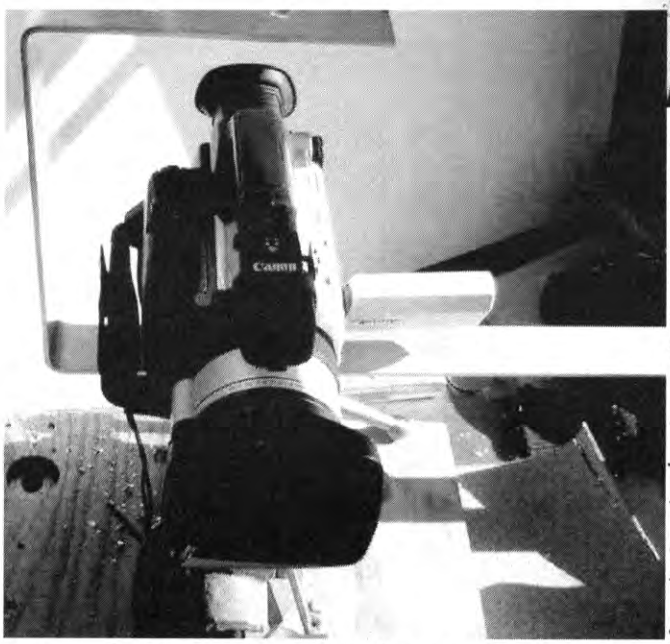


Now put the bar into the vice at the 14" mark. Bend the bar at 90 degrees again, making the bar into a big "U".



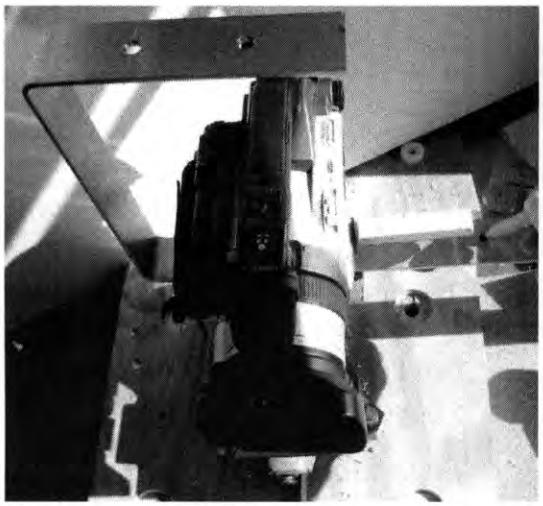
If you have any problems getting a 90 degree angle on either of these bends, you can tap down the last few centimeters with a hammer.

6.

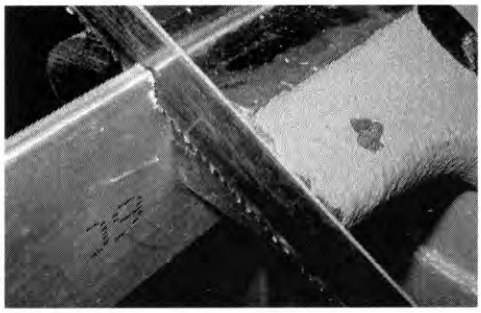


Now we need to cut off the excess bar from the camera section. Use your camera to figure out the proper spacing.

Tilt your bar upright with the "hole" section on top. Set your camera on the bottom portion. Give it a little breathing room between the tape loading side and the vertical side of the "U". You don't want to have to take the camera off the rig just to put a new tape in.

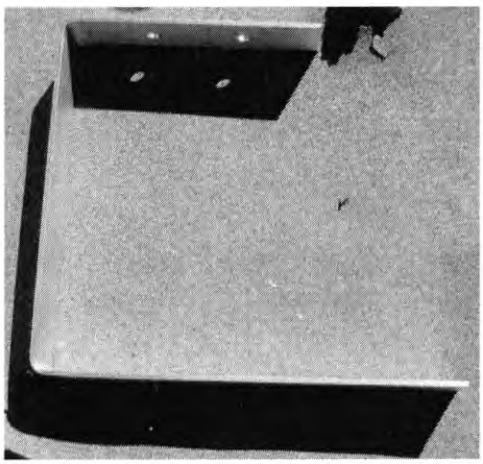


Now open the LCD monitor on your camera. Make a mark about 1" beyond the edge of the monitor. This is where we'll cut off the excess aluminum bar.



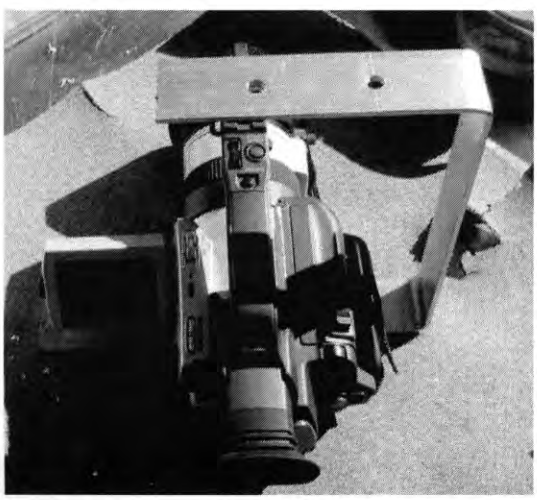
Clamp the bar in your vice and cut it off at that mark with a hack-saw.

OK, you should have something that looks like this:



7.

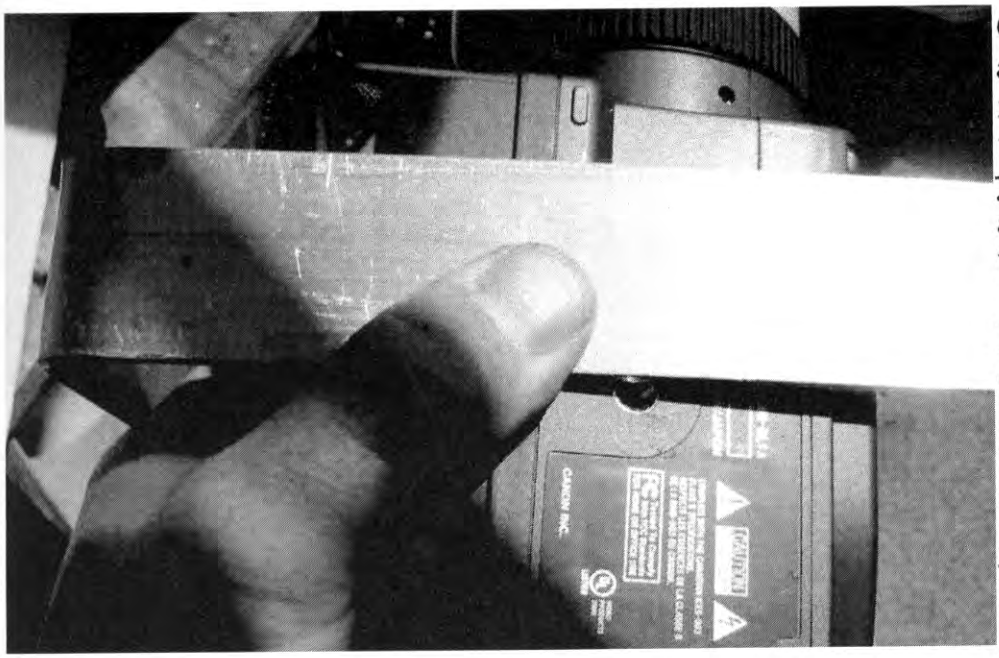
Now we have to find the best place to drill the camera hole.



Set the bar upright and put the camera on the lower bar with the LCD screen open...



...place a finger under the hole, and lift the camera off the table slightly. Adjust the camera back and forth along the bar until the bar balances level on your finger.

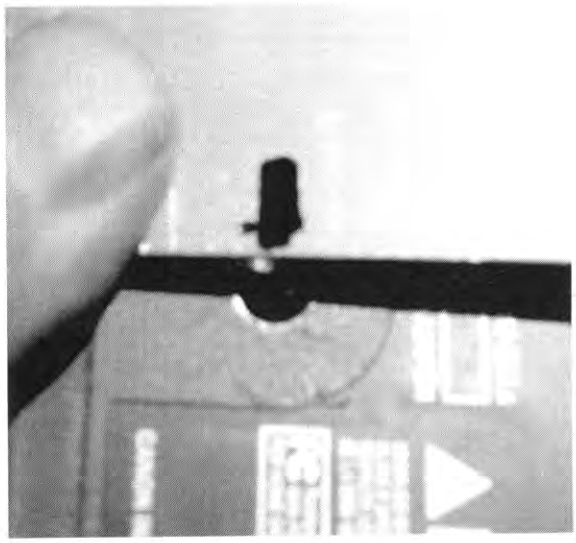


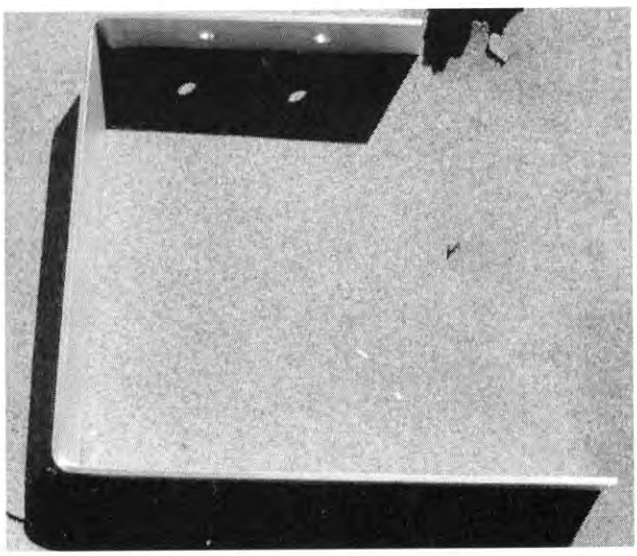
Grab the camera and bar as one, flip the whole mess over so you are looking at the bottom of the camera.

Locate the camera screw hole. You might have to slide the bar aside to see it, just make sure you **don't move the camera left or right from its balanced point on the bar.**

Once you find the screw hole, mark the bar at that point.

Make a dimple halfway across the bar with your center punch and drill a hole for the camera screw using a 1/4" bit.

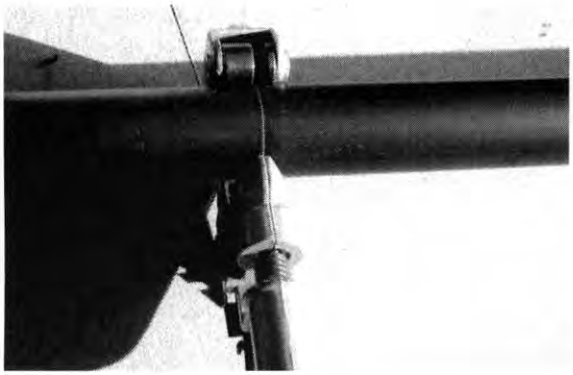




And that's your finished camera cradle.

8.

Next we'll be making the tube section. This is pretty simple.

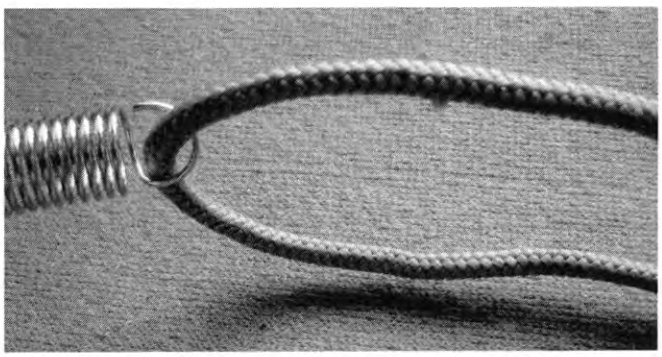


Using the pipe cutter, cut the 1" and the 1 1/4" pipe to 24 inches long.

9.

Take about 6" of cord and run it through one end of the spring.

If you're using nylon cord, take a match and melt the ends so they don't become frayed.





Run the two ends through the center of the plastic socket.

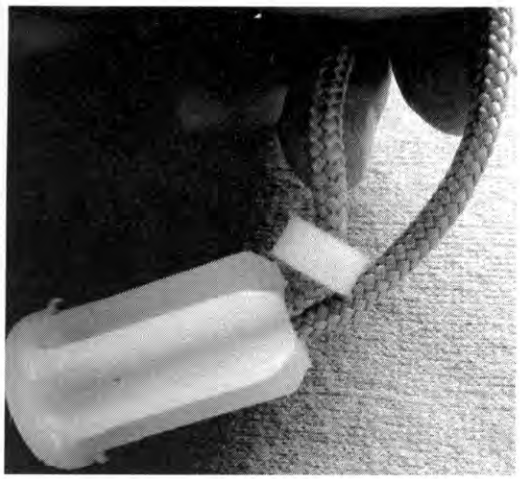
Use a screw driver to shove the cord out the other side if you need to.





Pull the ends tight so that the spring sits tightly in the hole.





Slip a washer or nylon spacer on one of the cord ends.



Tie a big honkin' knot and cut off the excess cord. Again, use a match to melt the cut ends. Make sure the springs stays tight against the socket and the knot is centered and is smaller in diameter than the widest part of the socket.

Take your hacksaw and cut about 4" off of the threaded rod. If you made the Shock Corridor Stabilizer you should have some left over rod laying around. If you haven't made the stabilizer yet, Hold on to the rod and extra aluminum tubing.



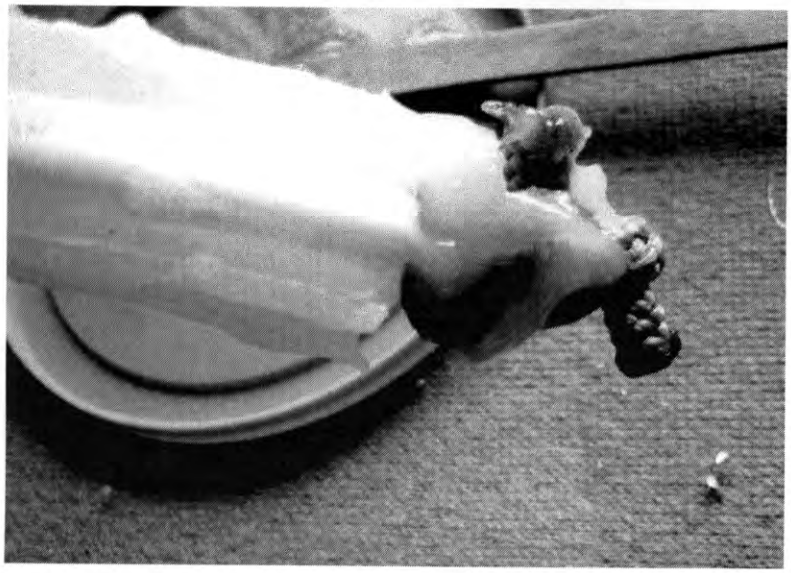
Mix up some epoxy...

...glupe it on to the other plastic socket, and hammer the socket into the smaller length of tubing.

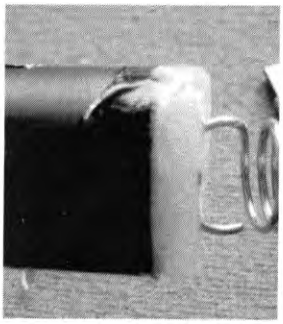




Coat the first inch or so of the rod with epoxy and screw it into the hole in the socket. Until you only have about an inch showing. Vice grips will help a lot!



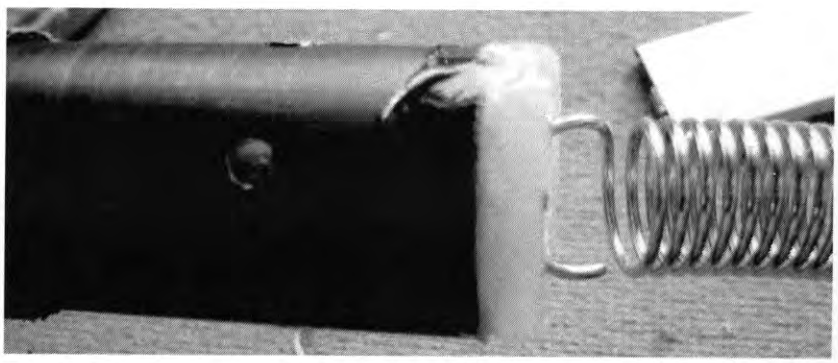
Take the socket with the cord in it, and coat the socket and the cord with the epoxy.



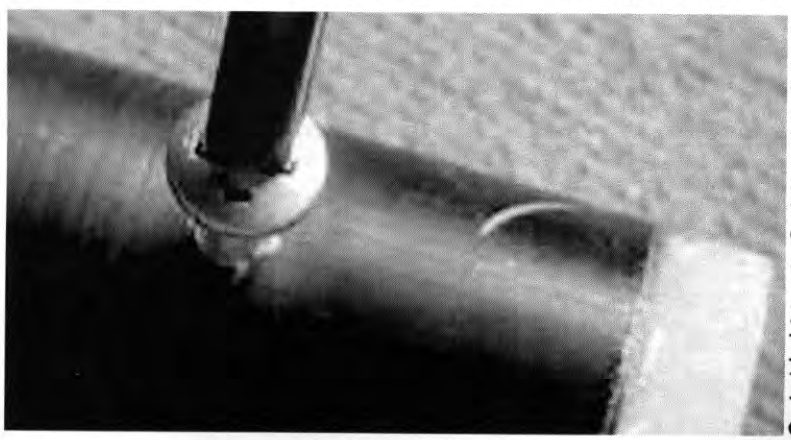
10.

Pound the spring socket into the other end of the tube.





Drill a hole through one side of the tube. Try not to go too far into the socket. Do the same on the spring end.



Put a small screw in the hole and screw it into the plastic socket.

Do the same on the other end. Set it aside for 24 hours to let the epoxy dry.



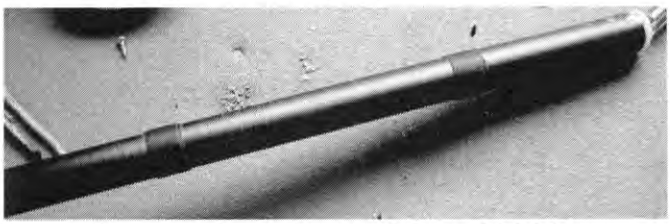
11.

Now we need to set up a little padding on the inside leg so the outside leg doesn't clang against it.

For that I'm going to use a little camera tape. You can use gaffer's tape, Duct tape, first aid tape... cloth based tapes work best.



Simply wrap the tape around enough times to cushion the outside tube, but still allowing it to move freely up and down. Put the tape on a couple of spots.



12.

Next we're going to add a little control ring that will allow you to adjust the amount of spring going to your camera.



For this you'll need the 1" plastic leg cap.

We're going to cut off the top, and a good way to do this is to stick the cap on an extra piece of tubing you'll have laying around...



...take a utility knife and cut around the top of the tube...



...and there she is.





Slide it onto the inside leg near the bolt end. This will act as a "stopper" for the outside tube.

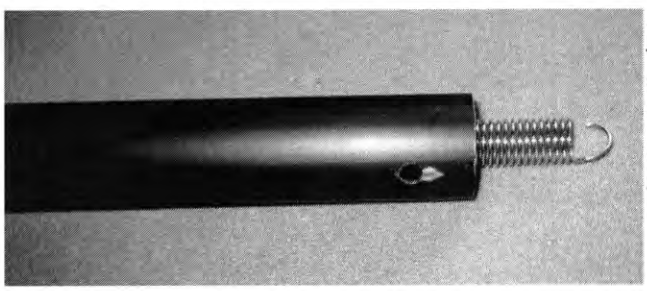
13.

Take the larger tube and drill a hole a 1/2" or so from the top.

I'm using a drill guide for this task because it keeps the holes straight. I highly recommend this guide if you're going to build most anything else made of metal in this book, especially the Stabilizer.

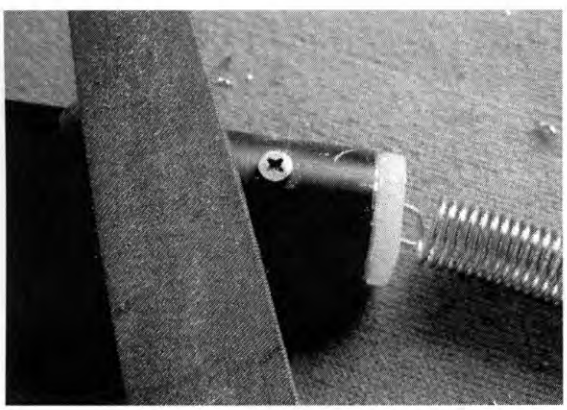


14.



Now slide the outside tube over the inside tube until the spring comes out the top.

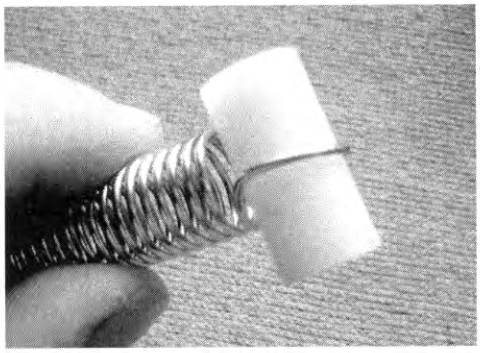
NOTE:



If your screw on the spring end gets caught on the outside tube, take a file and file it down until the tube slides smoothly.

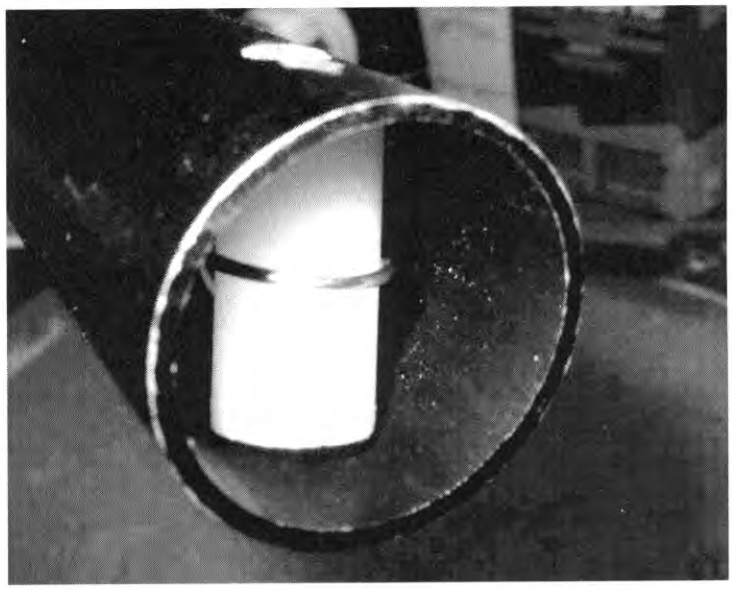


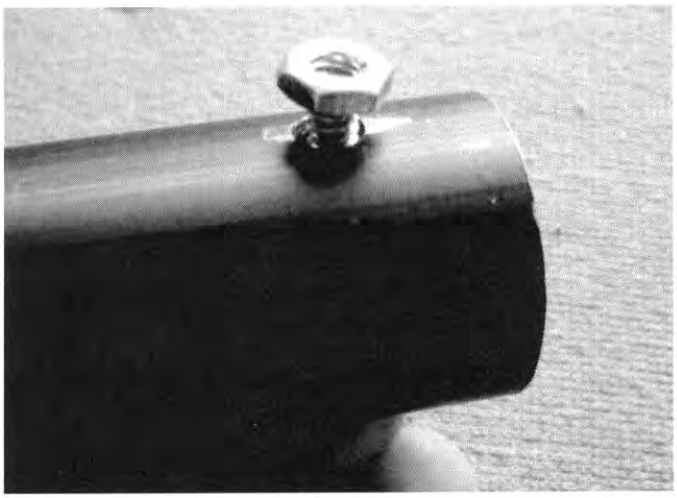
15.



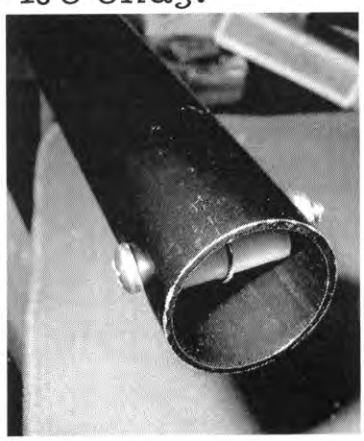
Slide the nylon spacer into the top of the spring.

Line the spacer holes up with the holes on the outer tube.

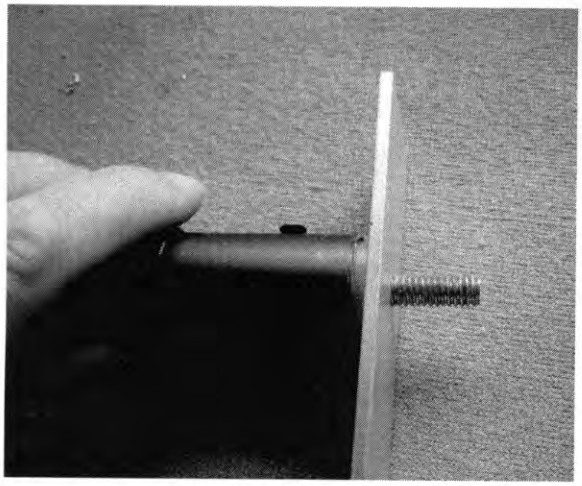




Slip the bolt through the spacer and tube and add a nut. Tighten the nut down and make sure it's snug.

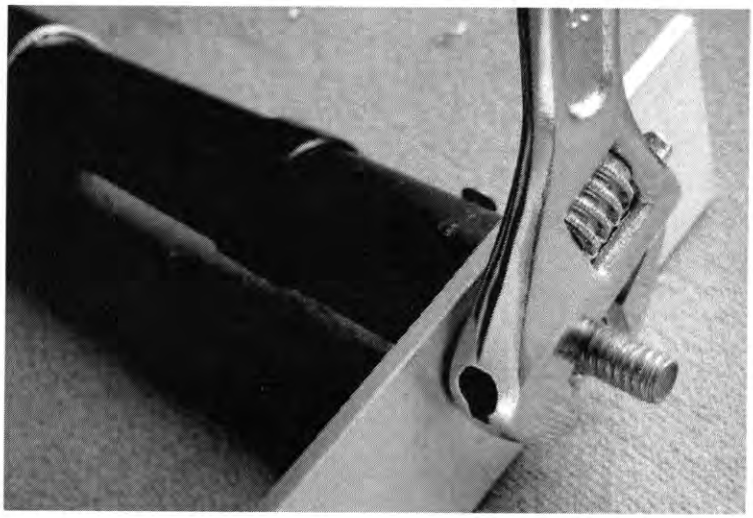


14.



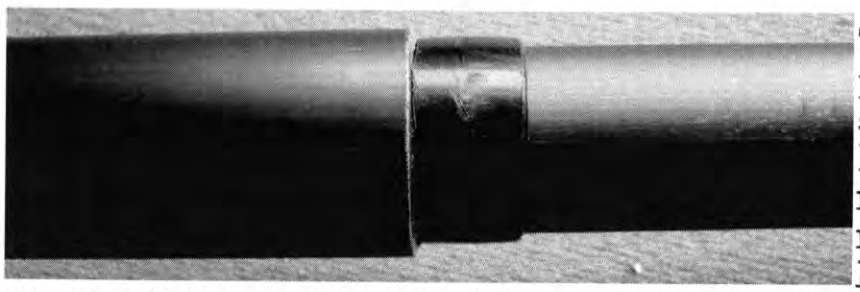
Wow! We're just about finished.

Take the camera bracket and slip it onto the bolt on the arm.



Tighten on a stop nut and you're done!

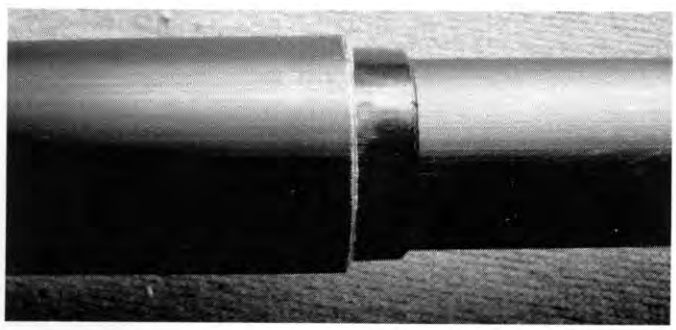
Before we go, let's take a closer look at the plastic ring you put on the inner post.



Try sliding it up the post. Notice how the spring tension changes. Most of the time the rig works well with the ring all the way at the bottom, letting the rig do its thing without the ring in play at all. Just play around with it to find what works best for you.

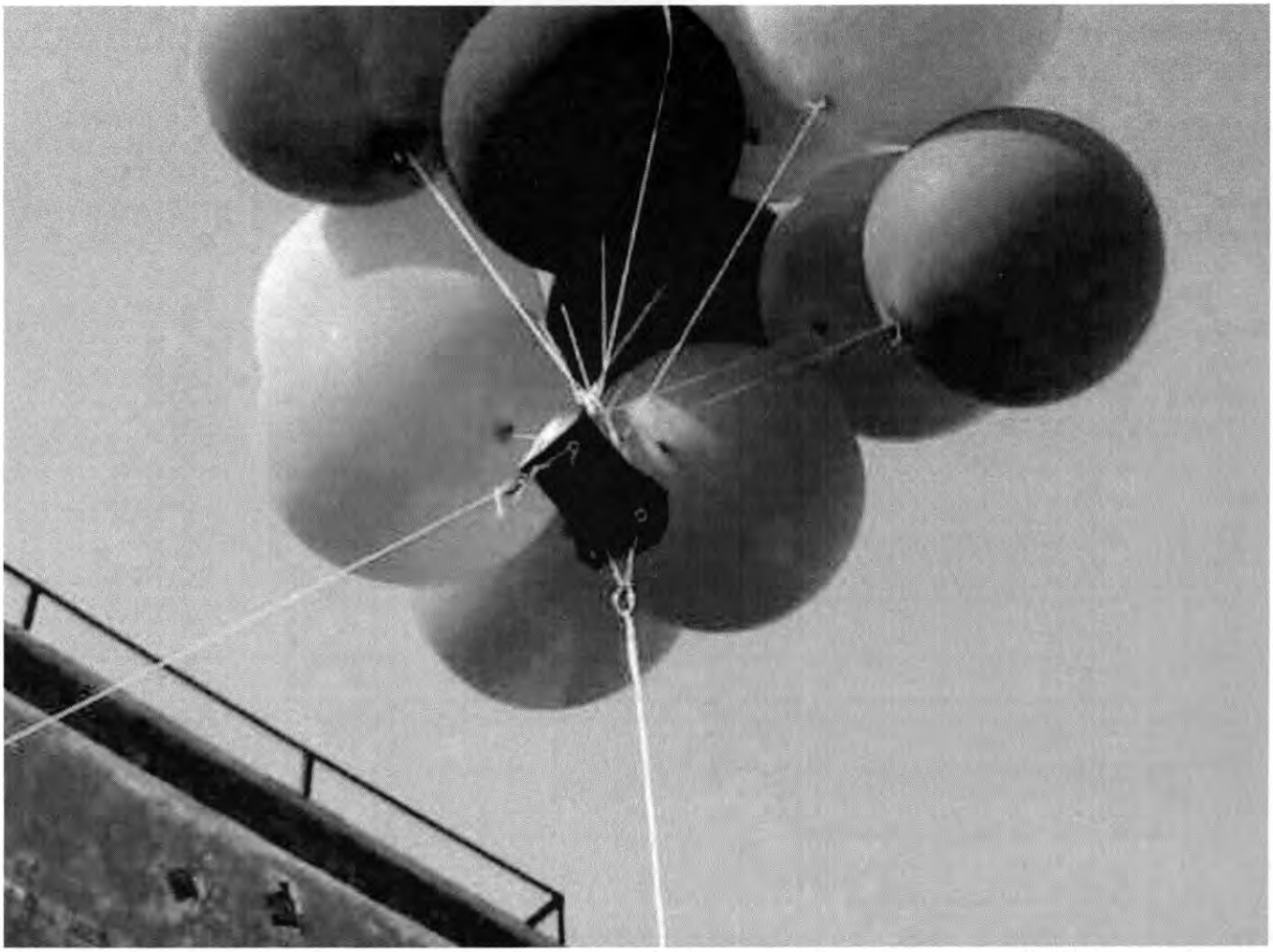
"Hey! What if I don't want the spring in play at all?"

Easy. Just use a little force to push the outer tube half way down the ring. Now you have just a big stick with a camera on the bottom.



Using the Sweet Smell of Success Pooper Scooper Cam is very much like walking with the camera Stabilizer, so just refer to the working instructions at the end of the Shock Corridor Camera Stabilizer chapter.

THE TOUCH OF EVIL CAM



Yep, those are balloons. The amazing advantages of this rig are that you can walk it like a super smooth Stabilizer--without hardly any practice, then crane up as high as your cord will reach to unbelievable heights, and back down again. The bad news: it doesn't work with any sort of control in winds above 5 mph and it can be costly depending on the weight of your camera. I figure in about $100 bucks for the helium and balloons alone for a days worth of shots. More if it is hot outside. Although, if you buy the big 3' or larger balloons and are careful, you can reuse them. Another down-side is that the balloons take up a lot of room, limiting the spaces in which you can use the rig.

But given all that, you can leave your audience in awe of a great shot, adding a ton of production value for relatively little cost.

An interesting side note: I was showing an early copy to a director friend of mine, Peter Medak (The ruling class, Romeo is Bleeding), and he mentioned that the first "crane" shot was in D.W. Griffith's Birth of a Nation, using hot air balloons.

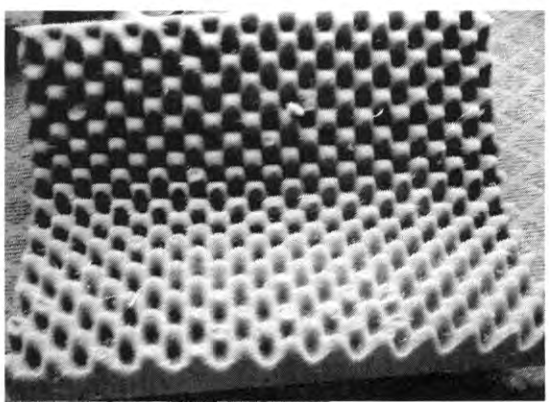
MATERIALS LIST FOR THE TOUCH OF EVIL CAM



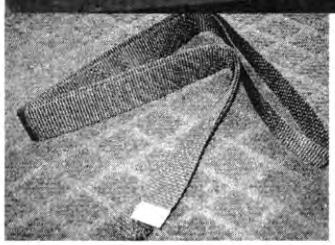
A soft lunch box. This is what your camera will ride in. These vinyl lunch boxes are cheap, padded, and light. Get one that is just big enough to hold your camera. If you've got a big lens, you can subtract that from the size box you need, because we'll be cutting a hole for the lens. ☐



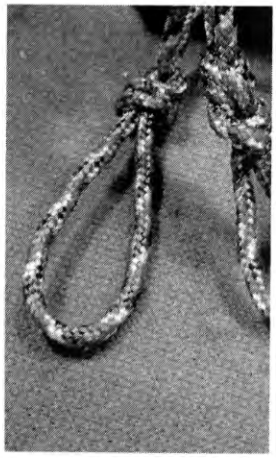
A grommet kit. These run about $10, and include everything you'll need to put grommets on your rig. A 1/2" grommet is a good size. ☐



Foam, 1-2 inches thick. This goes on the bottom of your soft lunch box, so you don't need much. I'm using egg crate foam, but this isn't necessary, the flat stuff is fine. ☐



One inch webbing. 3 feet is plenty. ☐



A very strong yet light cord. I got this at a mountain shop. If you get 50' or so, you can use it to tie the balloons to the rig.



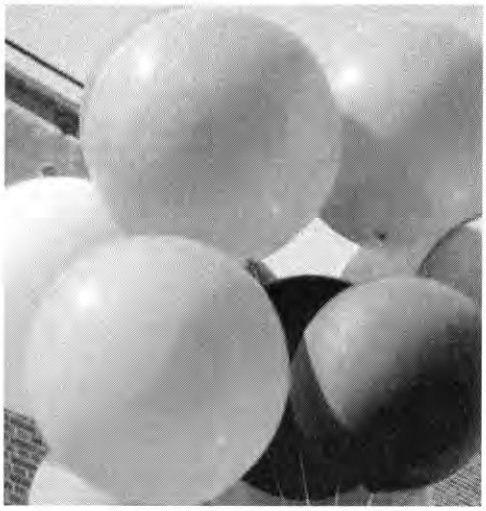
Nylon rope. 100' is a good start. You might want two different colors.



(4) clips. You can find these in many hardware stores, sporting goods shops, army surplus, etc. They're little key rings with a screw collar.



(2) Carabineers. These aren't the ones used to hold humans to mountains, but the smaller ones for equipment.



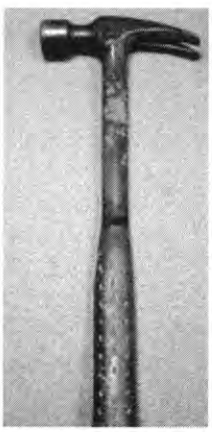
36" diameter balloons. Read the formula at the end of this chapter to figure how many you'll need.



Helium. The ones you rent are much, much cheaper than the tanks you can buy.

A roll of electrical or gaffer's tape.

TOOLS LIST FOR THE TOUCH OF EVIL CAM



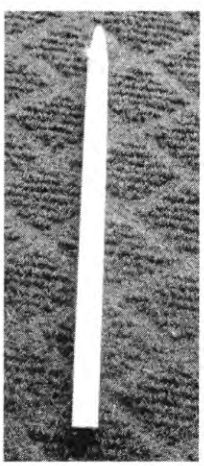
A hammer.



A Hot Glue gun. This is optional if you're going to use tape for your camera lens hole.



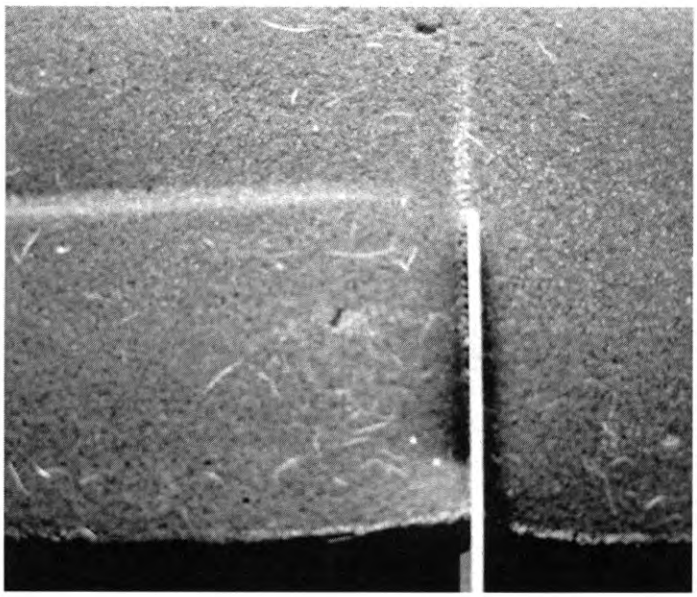
Scissors.



A grease pencil. Also known as a China Marker and/or a sharpie.

Let's build it

1.



Cut the foam to the size of the bottom of your lunch box.



2.

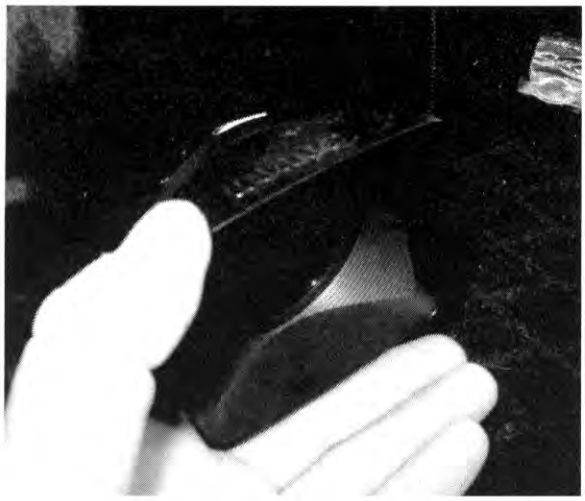


Set the camera in the case on top of the foam...

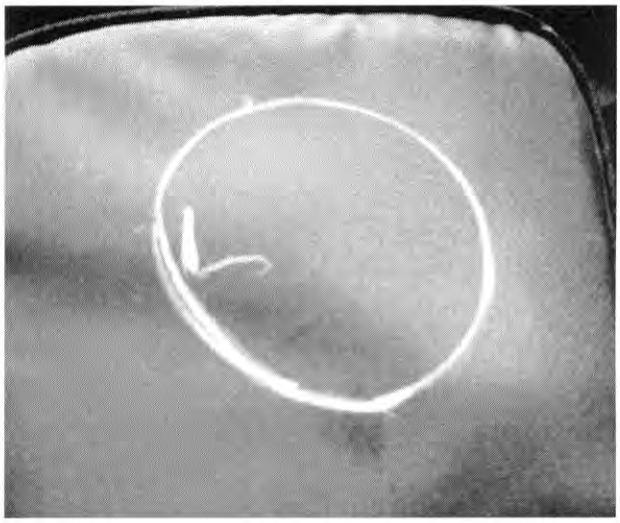


...feel around for the edge of the lens on the outside of the case and mark the edge with a grease pencil or sharpie.

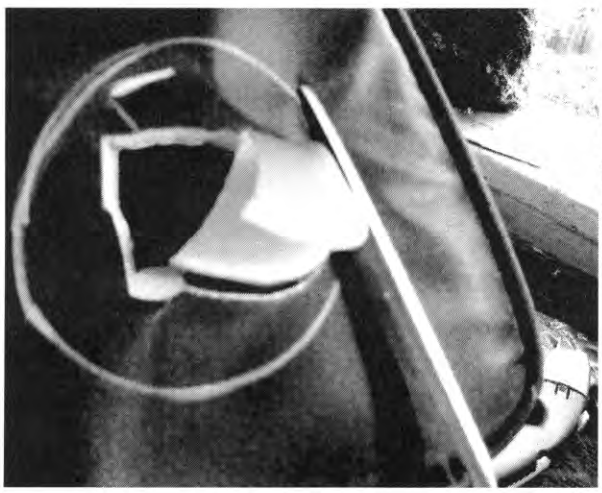




Set a lens hood or filter or lens cap against the mark you just made, and trace a circle around the edge of the lens cap.



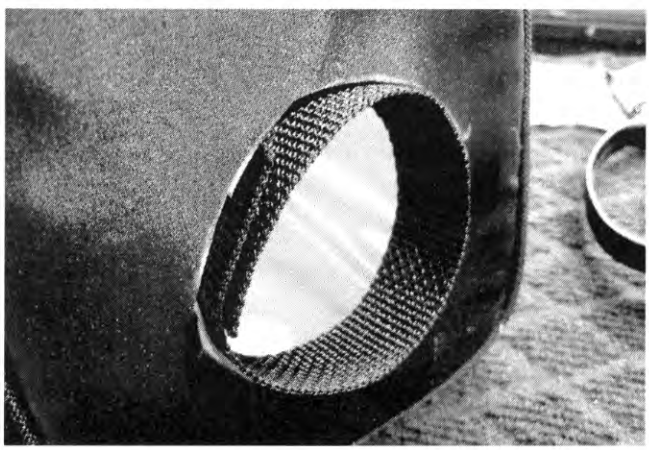
3.



Cut a hole in the case around the mark. You might want to go about a 1/4" bigger than your mark.



4.

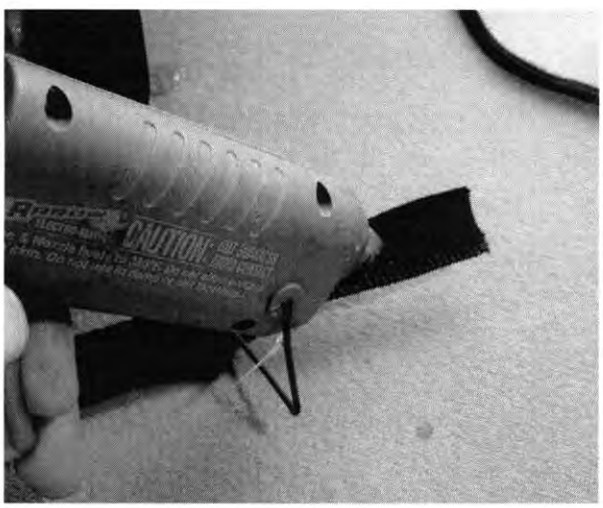


For this next part, I'm going to reinforce the hole with some webbing. If you'd like to do something that's a lot less work, just use gaffer's tape or duct tape. I like the webbing because it's a little more permanent and keeps the hole stiff. Put a length of webbing in the hole, and cut off the excess.



Whenever you cut nylon webbing or rope, use a flame to melt the cut end so it doesn't fray.

5. If you've got the skills, you can sew this webbing around the edge of the hole. I don't. I'm going to use a hot glue gun. If you've never used a hot glue gun, heed these words: HOT. GLUE. This stuff just isn't hot, it's red hot poker in your eyeballs hot. And since it's glue, there's no getting off your skin until it's burned you to the bone. BEWARE!



Don't try to glue this all at once. Just do a couple of inches at a time.

Fold the webbing so it forms a slight 'V' along the length so you know where the center is.

Add the glue.

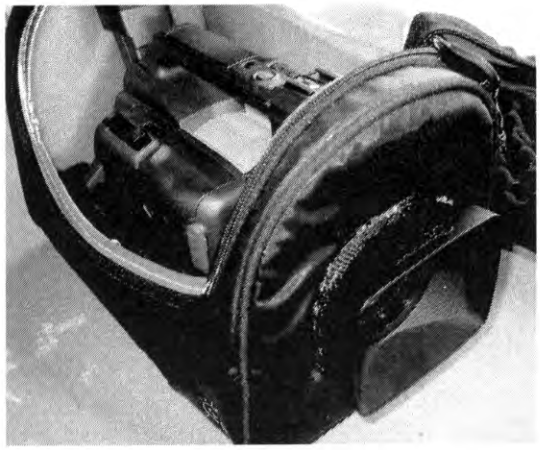


Work it around the edge of the hole, half of the webbing outside and half inside the case.



Just keep adding glue to it a bit at a time, hold it until it dries and move to the next bit. Clothes pins can be very handy here.

Before moving on to the next step, make sure your lens can fit through the hole. If it can't, cut the hole bigger and re-glue the webbing.



6.



Now we're going to add these 4 grommet holes to the top of the case.



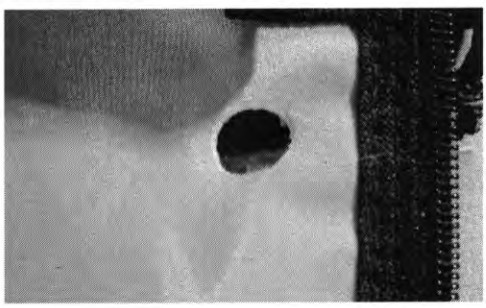
Take a sharpie and mark four points, 2 on each side of the handle, for the grommet.



Open up the lid of the case so that it lays flat, and follow the directions that come with the grommet kit.



Use a hammer and the grommet hole punch to cut a hole around your mark...





...put the grommet pieces in the hole...



...use the tools that came with the kit to bang the grommet in place.



Finish up the other 3 holes.

7.



Do the same thing in each corner on the bottom of the case.

8.



Take some webbing and run it through opposite corners on the bottom. This is going to act as a handle.



Cut off the excess and tie it in a knot on the inside of the case.



Use some gaffer's tape or electrical tape to wrap the knot up into a tight little package.

9.



Back to the top of the case.

Loop some good cord through the grommets on one end.





Tie a clip to each end of the cord and cut off the excess. Do the same on the other 2 holes.



9.



Take some more cord and run it through the bottom holes in the same manner as the top.



Tie a loop onto each end of the cord...



...and clip a small carabiner through the loops.

That completes the camera case.

Hey, how much helium do I need!?

The rest of the rig--the balloons--is pretty clear on its own, but let's go over some formulas.

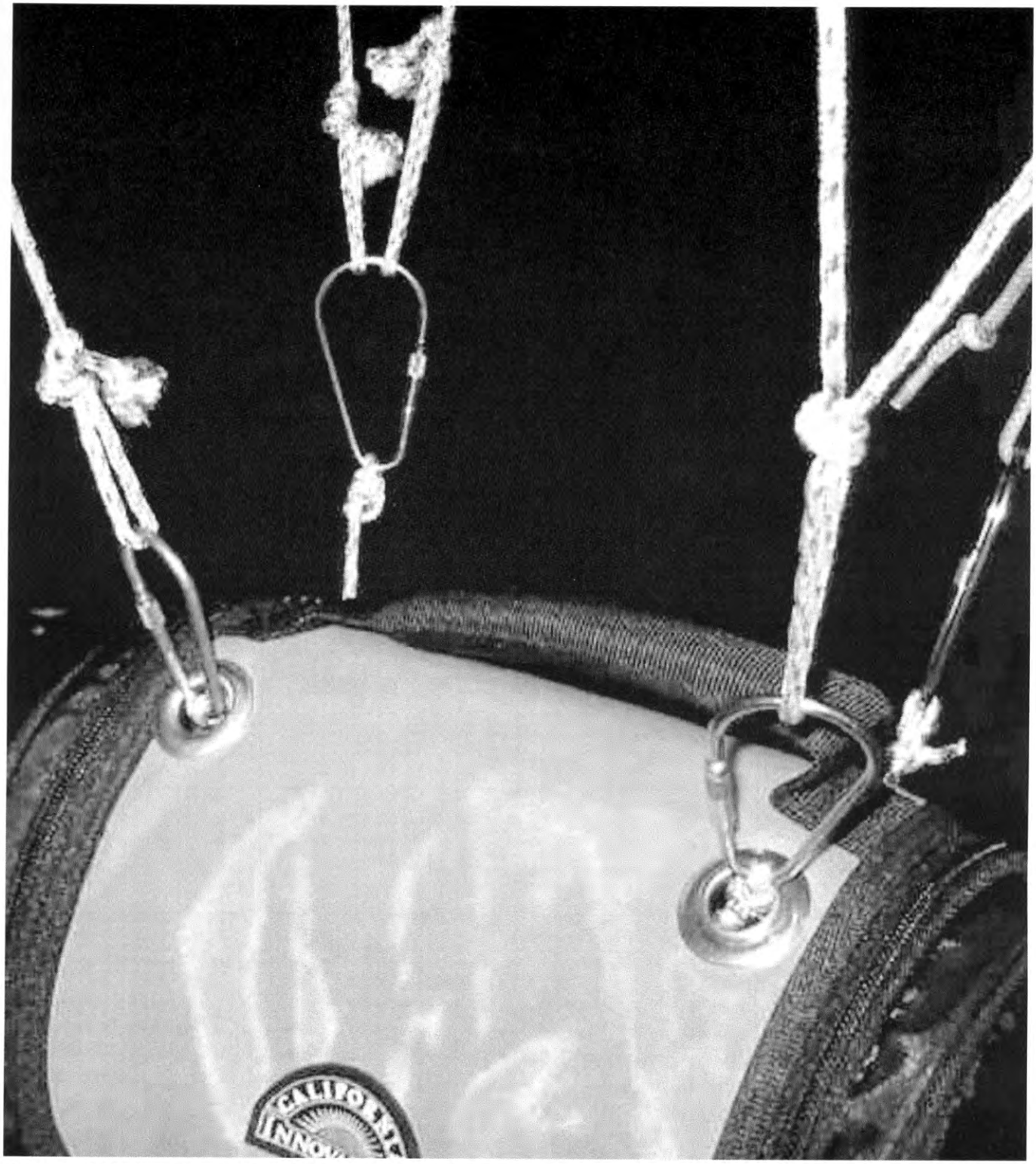
A 3' diameter balloon has a volume of 14 cubic feet.
14 cubic feet can lift 0.9 pounds. Weigh the camera and start calculating. Don't forget to put the battery back on, and to weigh the length of cord you'll be using as the tether.

Now, the formula above is an egghead formula, and real world experience says you'll need more helium than that. Not much more, but more nonetheless.

To make it more confusing: filling the balloons to their full capacity is not recommended. They can pop very easily this way. Inflate them to about 30" and they'll work better for you.

With that in mind; 55 cubic feet tank of helium can fill just over six 36" balloons. This is good for a small camera. The camera in the pictures is a Canon GL-2 and that took 11 36" balloons. It was pretty hot out, so I had to add one for good measure. (Heat and cold affects the lifting power. The balloons just don't last in really hot weather, so adding one more balloon than you actually need will solve that problem).

So it is all about as clear as mud, isn't it? I do it this way: use the egghead formula, then add 33% more. Don't skimp on the balloons or the helium, or you'll be running back to the party shop. I promise. And if you get any bright ideas about using smaller balloons...my first balloon cam used 16" balloons. 100 of them. It was a freakin' nightmare. Get the biggest balloons they've got.



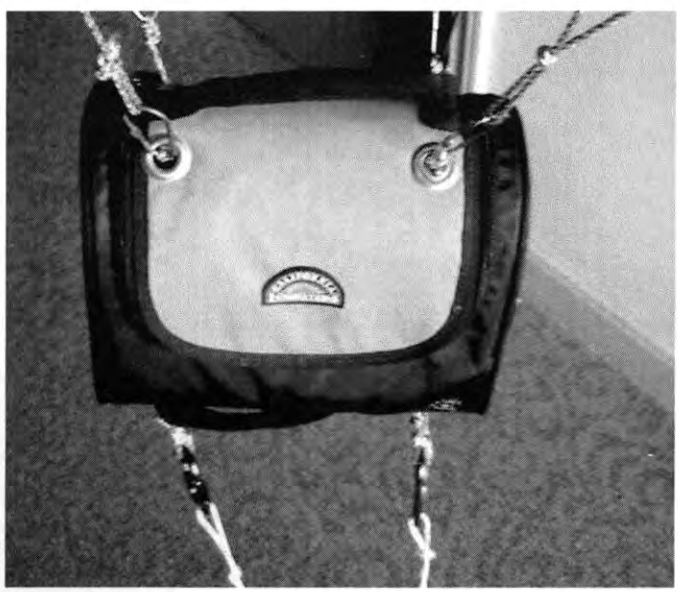
Attaching the balloons the the camera case is pretty straight forward. Tie a loop in the cord, and slip it on the ring. The picture just shows one on each. I've had as many as 4 balloons attached to each ring. Just make sure you have and equal number on each ring, and once they're on, make sure the rings are locked.



Tie a loop in the tether cord...



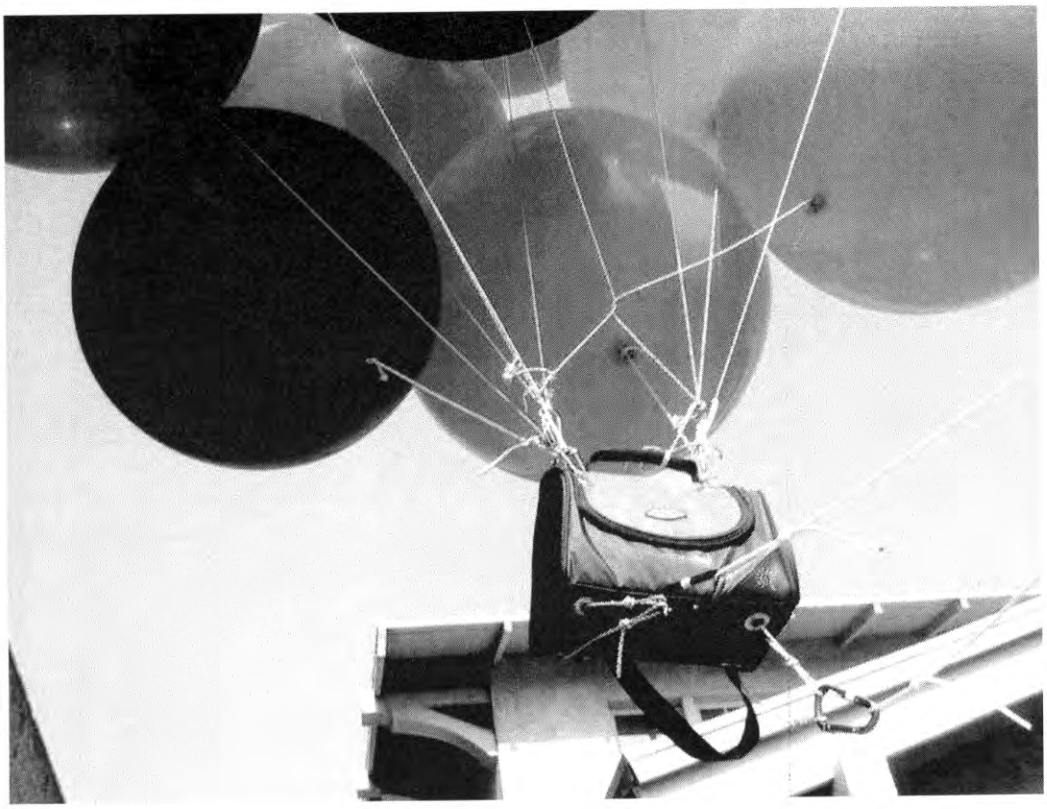
...and clip it in the bottom carabineer. I've never had a problem with these little carabineers, but if you want to play it safe, gaffer tape the clip so it doesn't open.

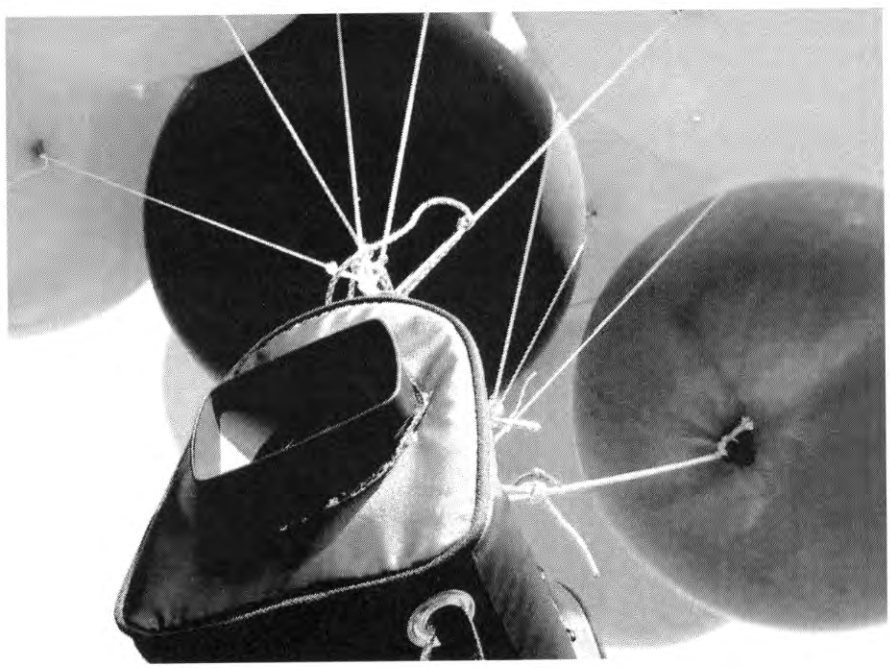


Although I don't have it here like this, you might want to have a different color cord for each of the bottom tethers. If they get tangled, it makes it much easier to sort out.

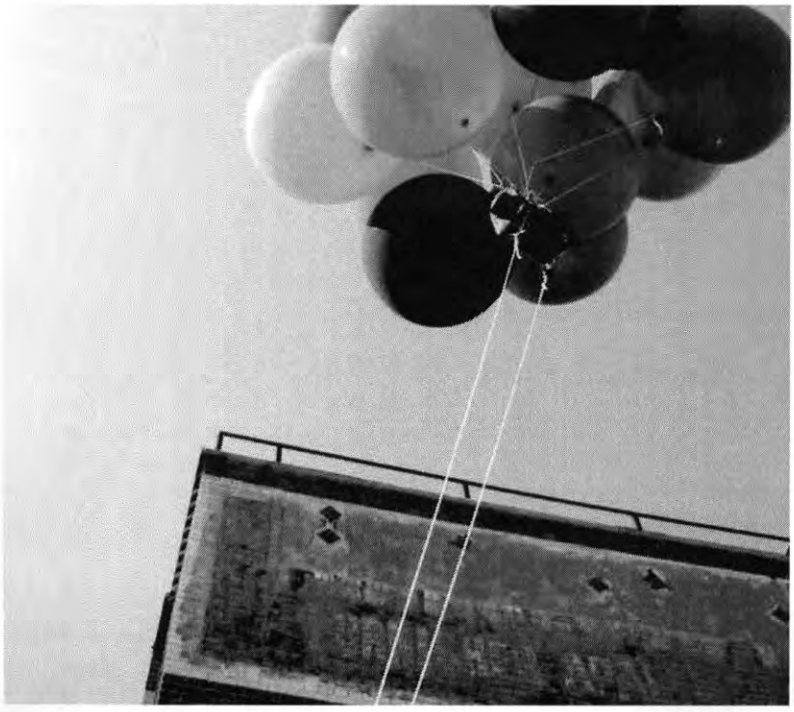
One last word: tie the end of the tethers to your belt or a big weight. You don't want the last thing you see is your camera going bye-bye.

Pictures of the rig in action

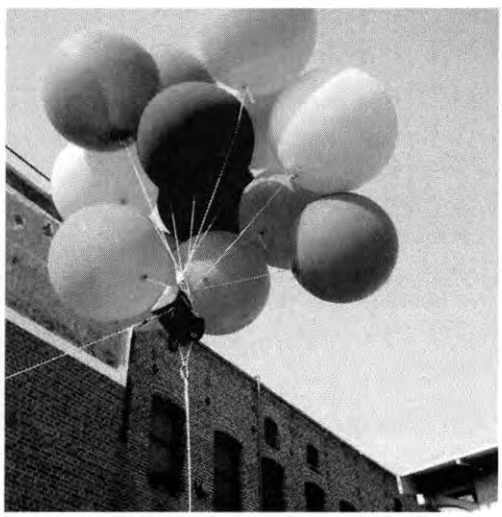


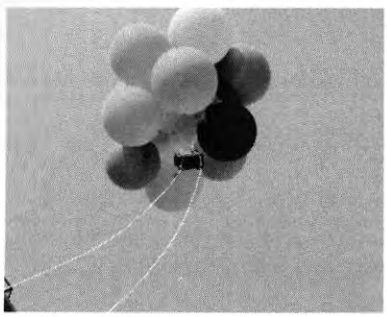



OWERS









THE HARDER THEY FALL SAND BAGS

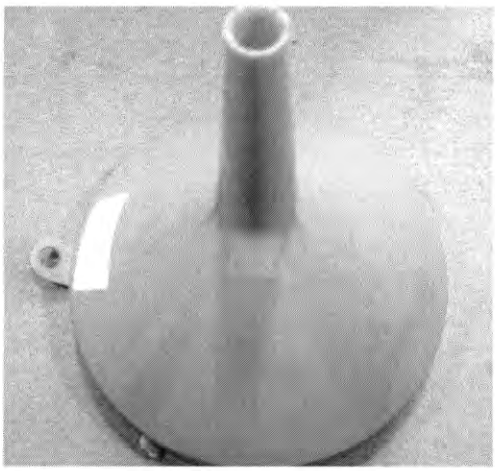


Sand bags. Not very sexy, are they? yet, if you were only going to make one rig in this book, I'd want it to be this one. I've seen a lot of injuries and equipment damage on sets because someone didn't bother to throw a couple of sand bags on a light stand, tripod, or c-stand. Sand bags are also handy supporting a camera where a tripod won't do. The 2nd bag in this chapter is great for laying dolly track across. Sand bags. A thousand uses and counting. Make a bunch of these and use them.

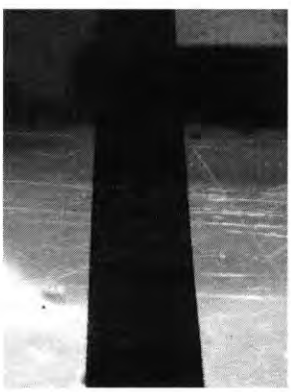
MATERIALS LIST FOR THE HARDER THEY FALL



Canvas. I'm just cutting up an old paint drop cloth. The thicker your canvas the longer it will last, so don't skimp. You can use denim too.



A big funnel. You can also just cut the bottom off a bleach bottle to make a funnel.



1 1/2" to 2" wide nylon webbing. You'll need about 2 feet per sand bag.

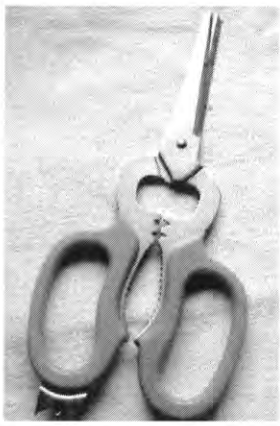


Sand. A 50 lb bag will do a little over 2 large sand bags.



(2) Heavy duty zip-lock bags, gallon size. If you get the Hefty brand with the zipper on the bag, you'll save yourself some trouble.

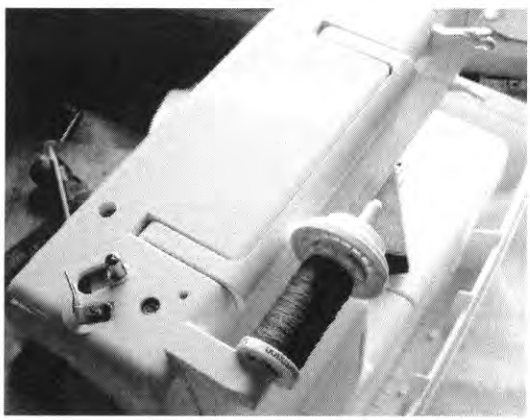
TOOLS LIST FOR THE HARDER THEY FALL



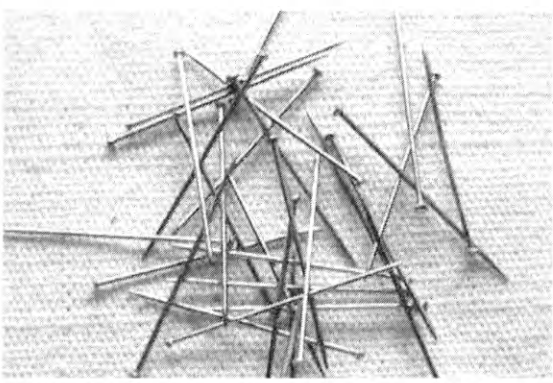
Scissors.



Pencil or Taylor's chalk.



A sewing machine.



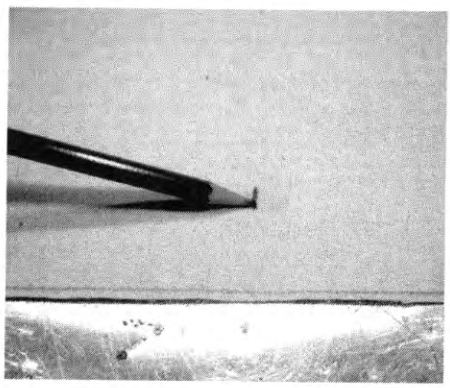
Pins.



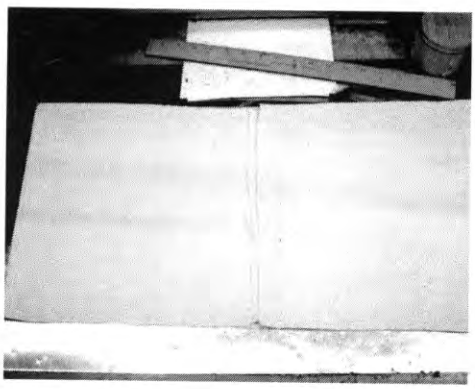
Measuring tape.

1. Cut a piece of canvas 48" long by 11" wide.

2.

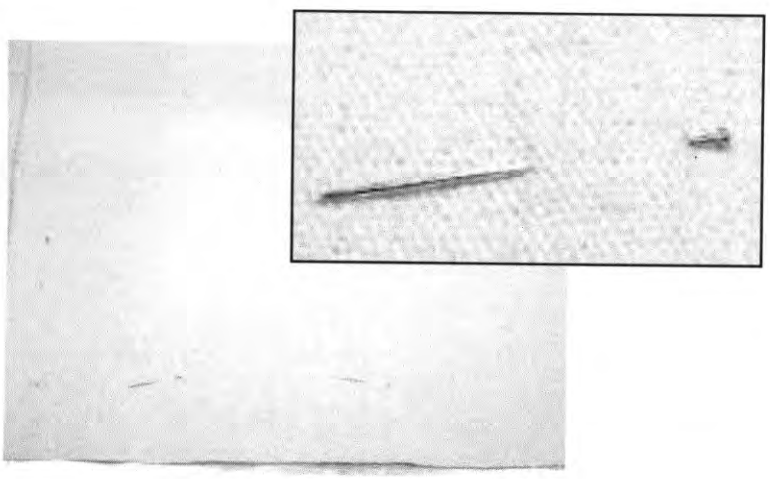


Mark the center of the canvas lengthwise at 24".

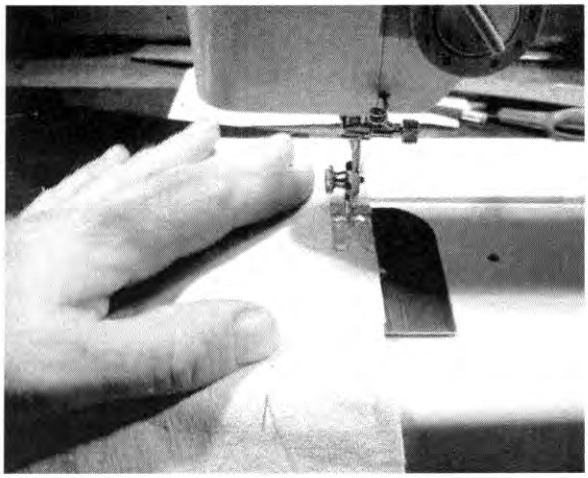


Take each end and fold the canvas so the two ends meet at the center line.

3.



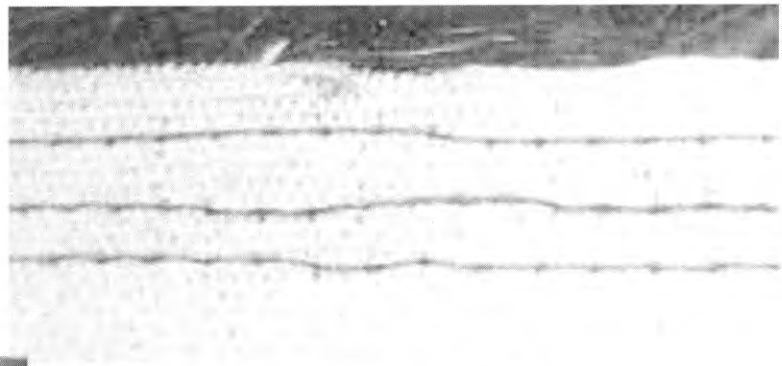
Pin the canvas in place along the open edges.

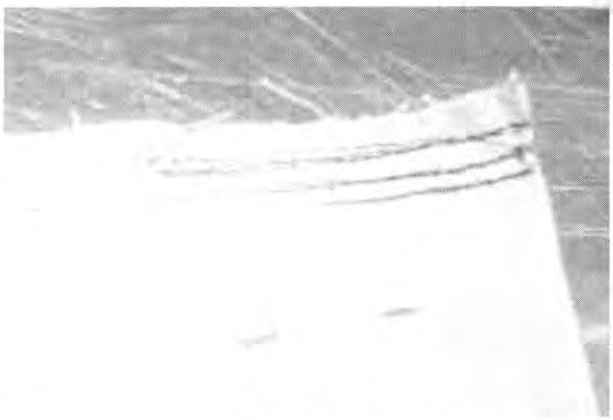


Sew one side the length of the canvas. Once you have a stitch running the length of the bag, do 2 more. We need a lot of strength here.

4.

I know, it's not very pretty, but I never said I could sew!





On the corners of the bag, do a few forward and reverse stitches to reinforce it.

5.

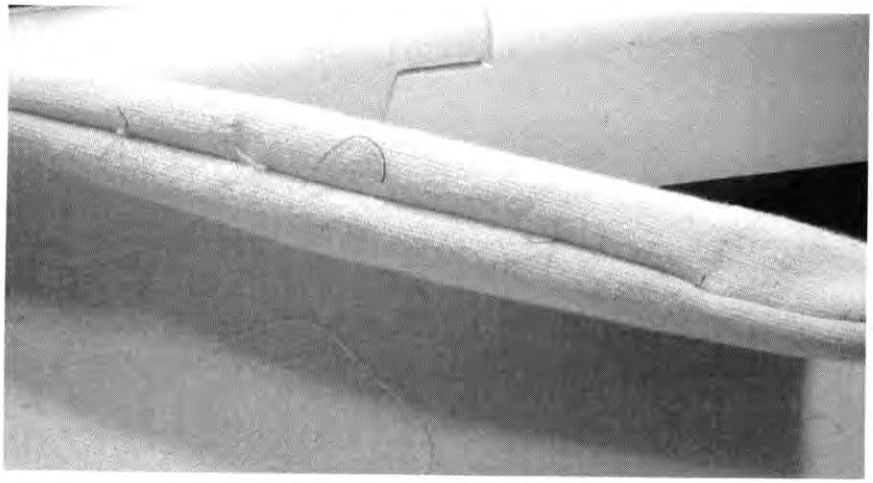
On the opposite edge of the bag, where the top edge of the canvas meets the middle, draw a line about 3" long. Do this on both pieces that you folded to the center.





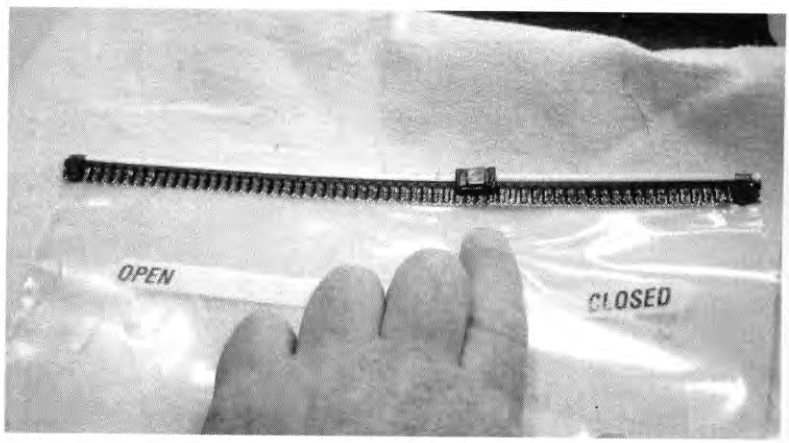
Stitch this side as you did on the other, but STOP AT THE PENCIL LINE on each side! We need to leave this bit open for now.

6.

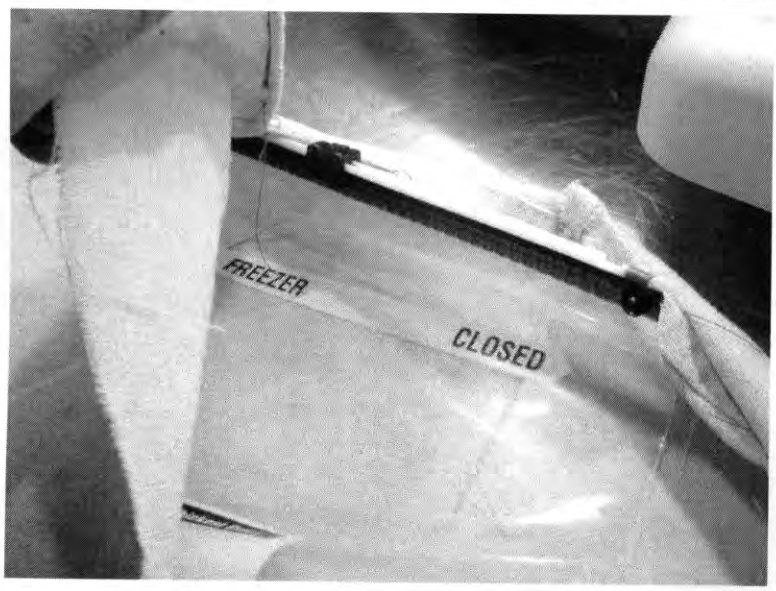


Flip Both sides of the bag inside-out, so your stitch is hidden.

Take a freezer bag, and close it except for the last 2 or 3 inches.

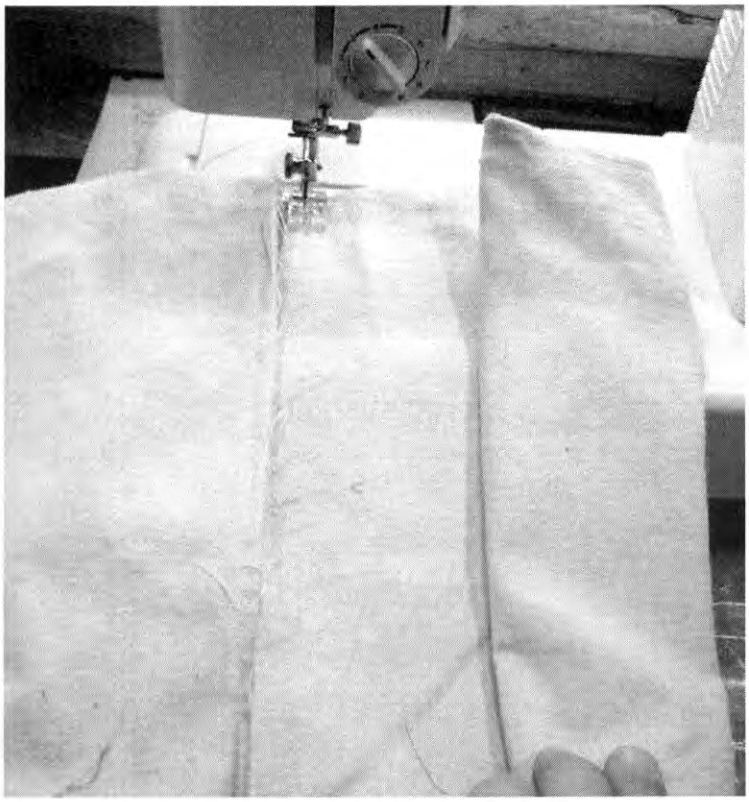


7.



Slide the plastic bag inside the pocket of the canvas. Do this on the other pocket of your sand bag.

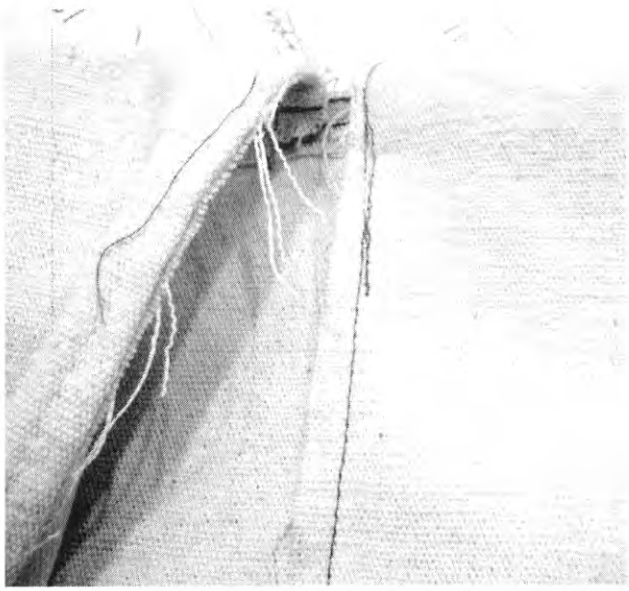
Note: The bags will hold the sand without using the zip-locks, but putting the sand in the plastic bags keeps everything neat while you're sewing up the little holes.



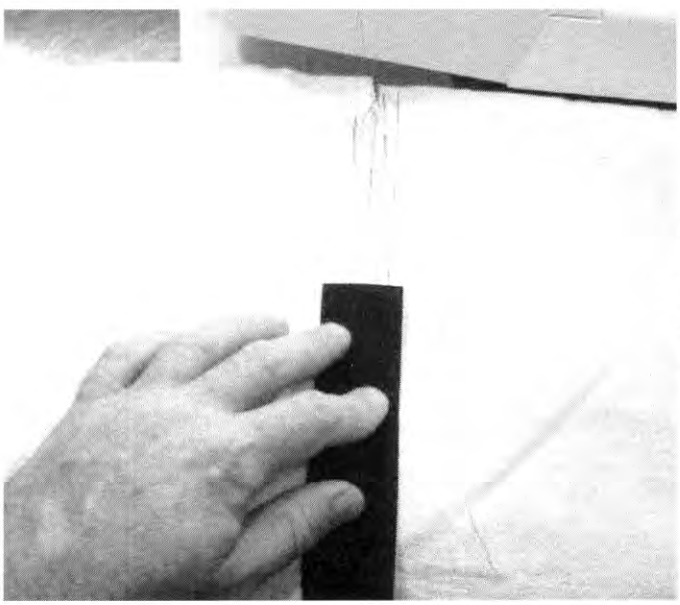
With your plastic bags safely inside the pockets, sew up the middle seam. Don't sew up the 3" opening from the pencil mark yet, and be careful not to sew into the plastic bag.

8.

Here's the right side finished. Now I'll sew up the left side.



Now take some webbing and center it so that is overlaps the seams you just sewed, starting about half-way across the bag.



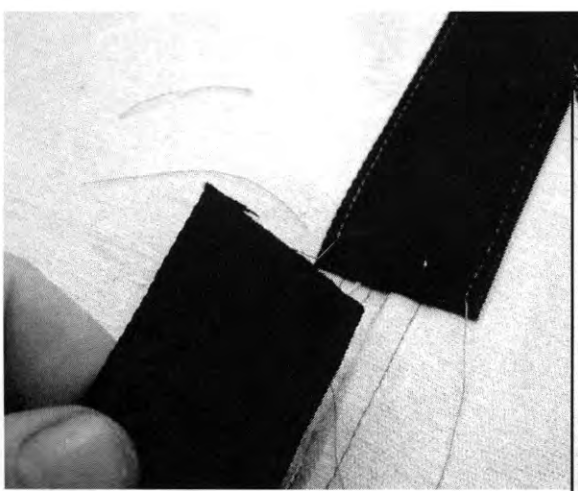
9.

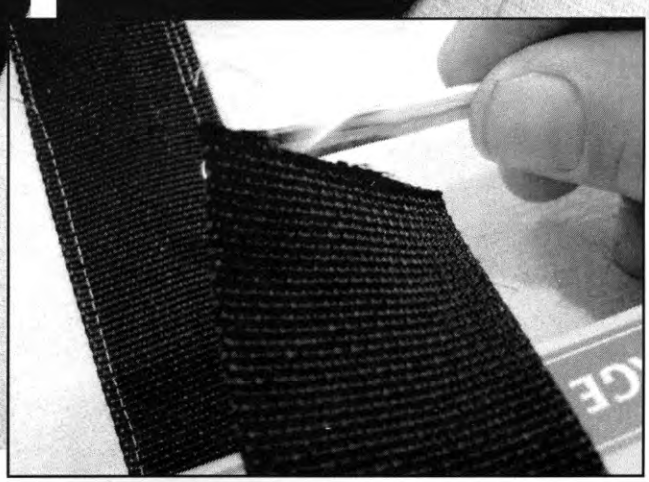


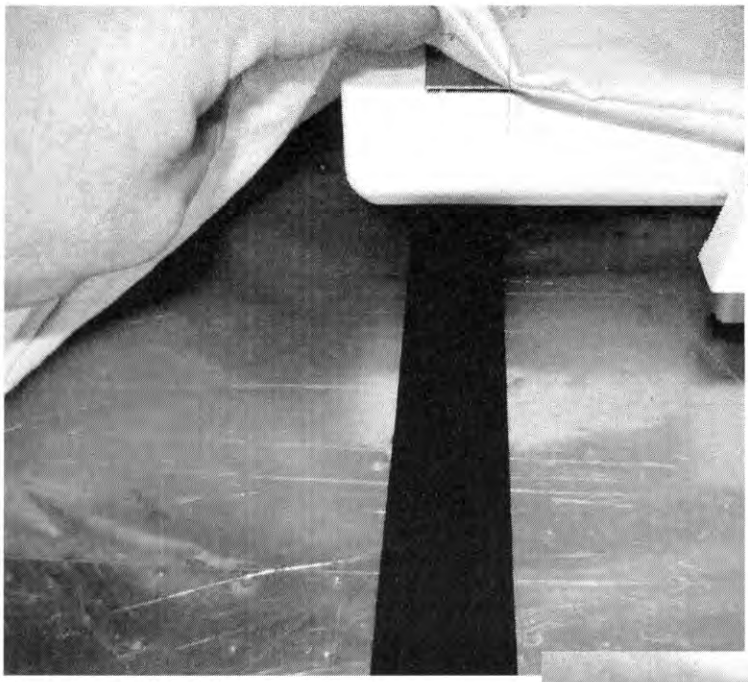
Stitch the webbing on, sewing all the way down the edge of the webbing to the side of the bag. Do this on each side of the webbing. You'll be sewing through two layers of canvas plus the webbing, so make sure you have a machine that is up to the task.

Loop the rest of the webbing under the bag and around until it meets up with the end you just sewed down. Cut the webbing at this point. Make sure that you use a match to melt the end of the webbing where you cut it. This will keep it from fraying.







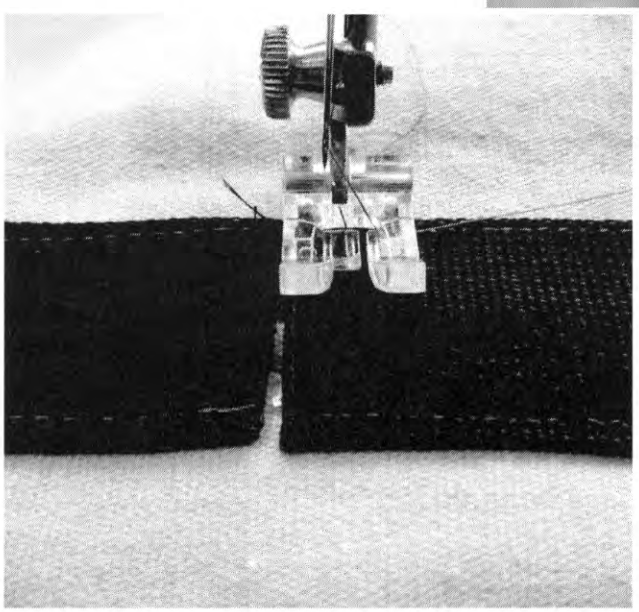


Run the webbing under your machine so that you don't sew the handle to the top side of your sand bag.

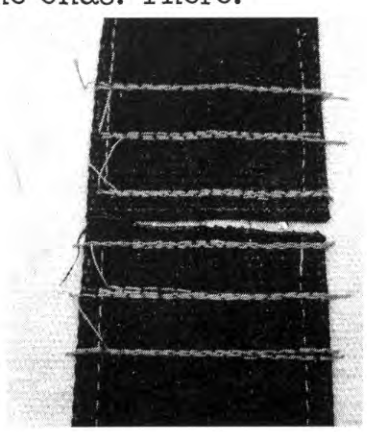
Bring this end around to meet the attached end, and sew the strap down as you did with the other end.



10.



Once the edges are sewn down, come back and do 3 or 4 stitches across the webbing. Feel free to reverse stitch a few times. Do this on each of the ends. There. Not very pretty, but strong like bull.

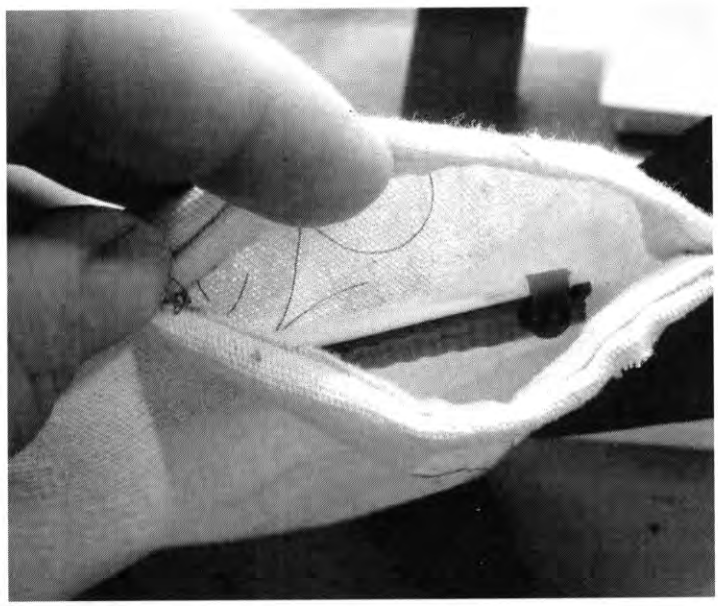




Here's what it should look like so far.

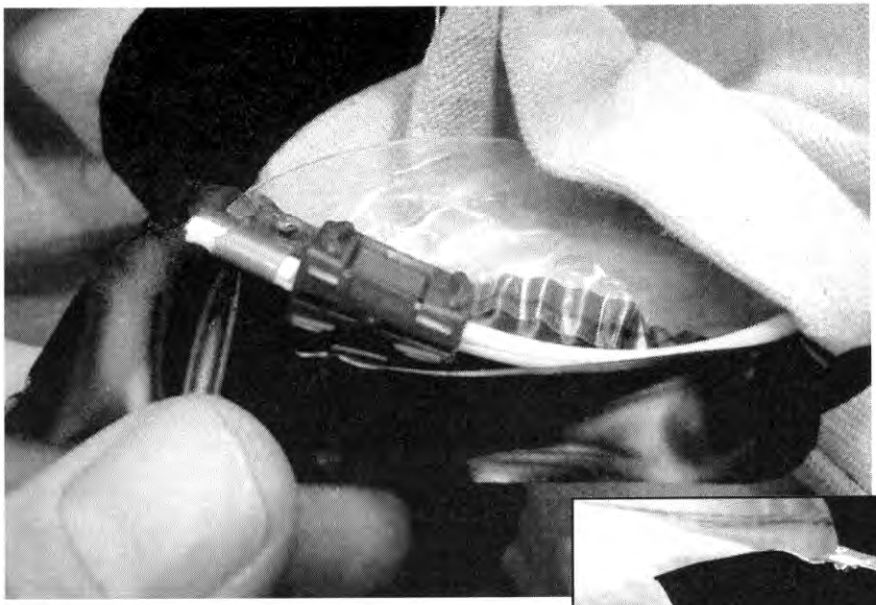
11.

OK, have your sand handy and locate the little opening.





Stick the funnel down into the plastic bag and fill that baby with sand. Lots and lots of sand.



Once the bag is full, you might want to tape the edge of the zipper on the zip-lock down.

12.



13.

Sew that little opening closed, and you're done with this side. Do it all again for the other side.



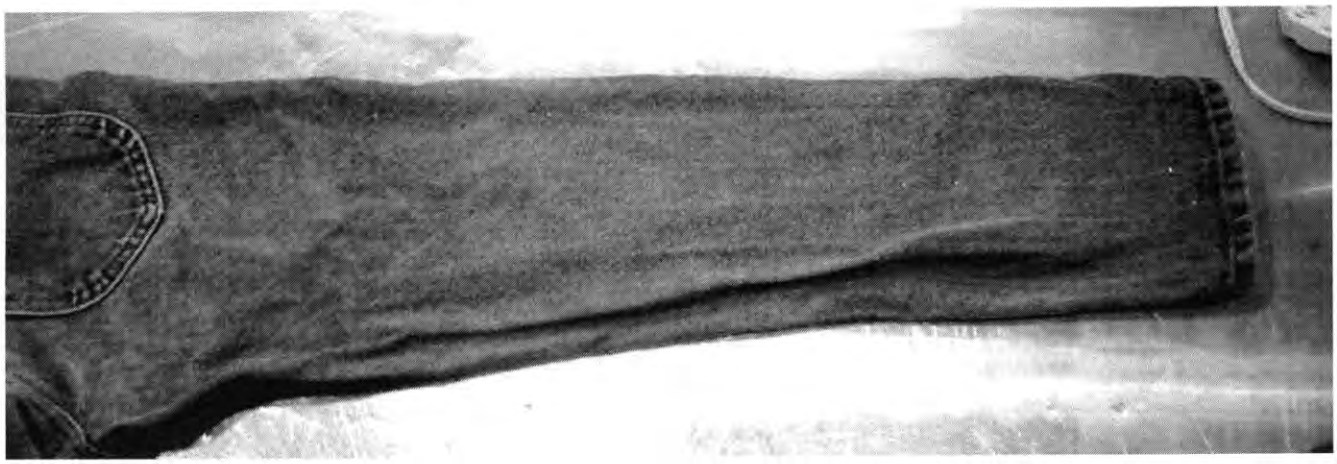


And you're finished. Make at least a couple more. You'll need three just for the tripod holding the crane.

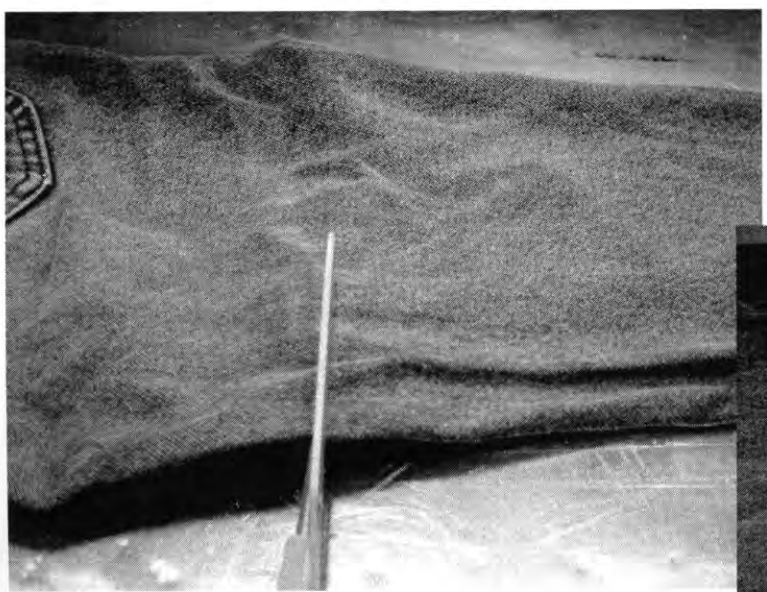
If this bag seems like too much trouble, check out the super easy to make sand bag on the following pages.

THE HARDER THEY FALL SAND BAG, JR.

Things just don't get much easier than this.



Head for your closet or a thrift store and get an old pair of jeans. Get the jeans in the kid's section. They're even cheaper and plenty big enough.



1.

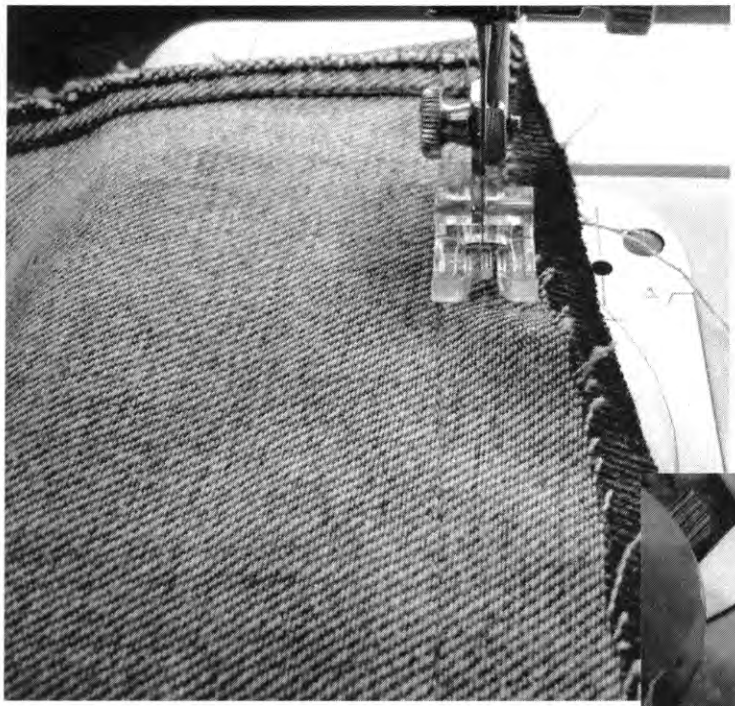


Start by cutting the leg off...



...then turn it inside out.

2.



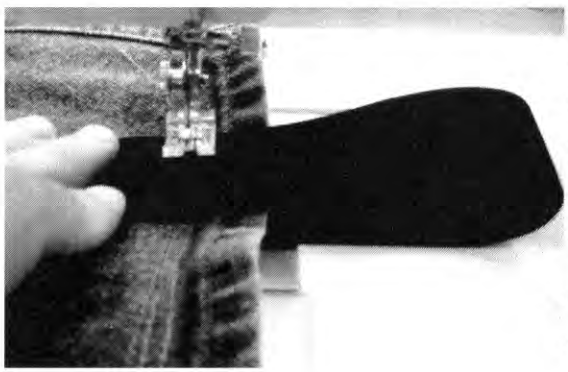
Sew up the freshly cut end. As with the larger sand bag, make at least three rows of stitches.





Turn the bag so that your hem in on the inside.

3.

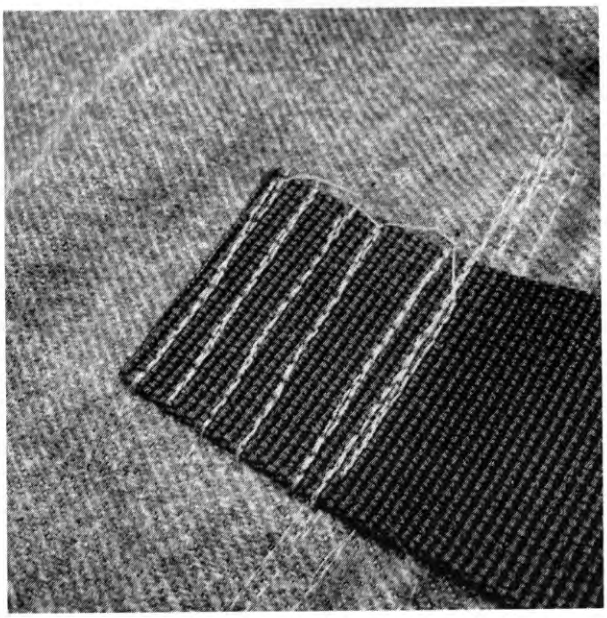


Grab about 10" of webbing.



Loop the ends over each side of the pant leg. Sew across the pant leg and webbing, but stop about 2" from the opposite edge.

4.



Once you've gone across the pant leg (and left a small opening), sew the strap down with 5 or 6 rows of stitches across its width.

Stick the funnel in the hole and fill the bag about 3/4 of the way full with sand.





Sew up the hole very tightly, please. We're not using a plastic bag on this one, remember.





And there she is.

I'm sure you'll find a ton of uses for these.

THE BIG CARNIVAL CRANE

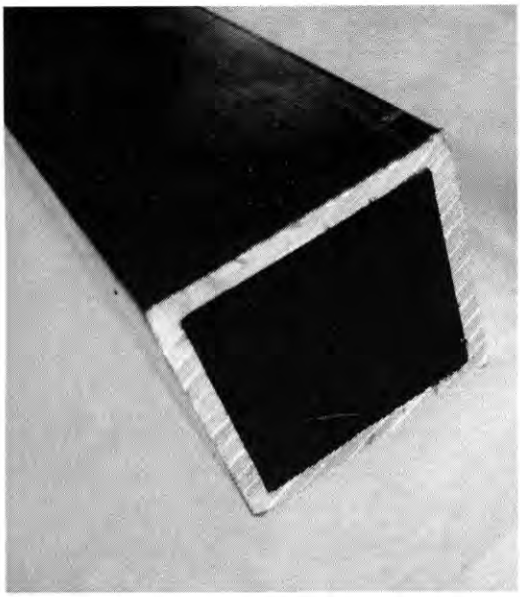


Alrighty then. Here we are at the last rig, The Big Carnival Crane. Whew!

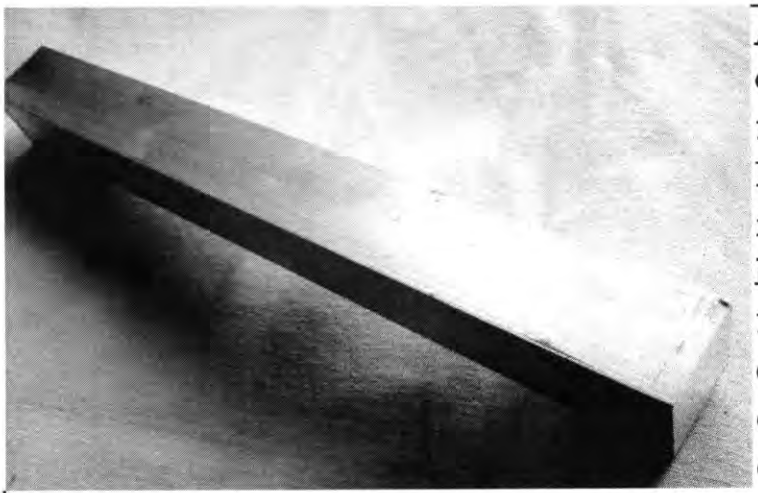
If you've never used or made a crane before, I want to really encourage you to make the Big Combo Crane first. The principles on the Big Carnival can be confusing to some. Also, review the actual building aspects of drilling holes, marking up metal, and the like by going over the instructions for The Big Combo starting on page 87. I'll not be discussing them in as much detail in the Big Carnival Crane.

The advantages of this crane are that it breaks down into about 4 foot long sections so you can throw it into the trunk of your car for easy hauling. Also, the upper arm moves, so can tilt the camera at will, or lock down the arm and leave the camera in one position for the entire move of the crane. A very useful feature indeed! I'm also going to show you how make this a long (mine is 16') crane, and still avoid the wobble that can happen on long runs like this.

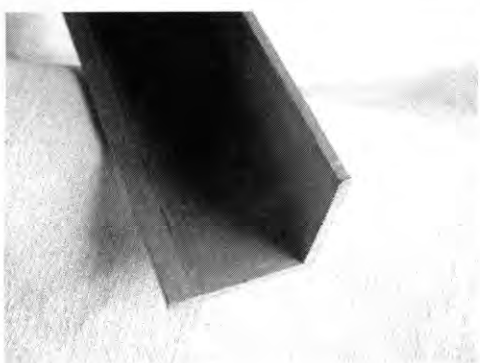
MATERIALS LIST FOR THE BIG CARNIVAL CRANE



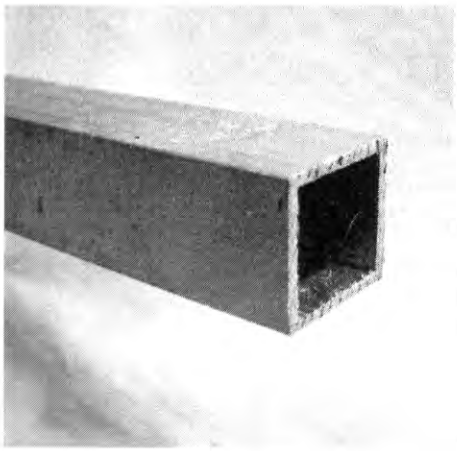
The Bottom Boom Arm is made from square or rectangle aluminum tube. This needs to be at least 1/8" thick and at least 1 1/2 inch square. You can also use a rectangle that measures at least 1" at the narrowest side, and 2" on the wider side. Length depends on you, but I'd keep it under 20' long. Since we're going to be cutting this into shorter lengths of around 4', you don't have to buy one big length (although this makes building easier). Dig through the remnants pile for shorter lengths and you'll save yourself some cash. ☐



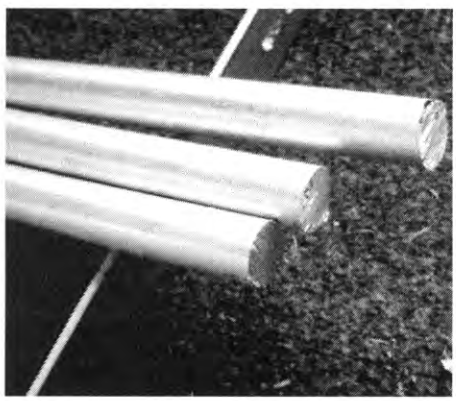
Aluminum bar. This has to fit exactly inside the above aluminum tube. You'll have to monkey around at the metal supply to find a good match between the bar they have and the tube. You'll need a 12" length for each cut crane section. I need three for my crane. Most shops will carry pre-cut 12" sections, but you might find that you'll have to buy a longer length and cut it yourself. Check page 326 for more info and options. ☐



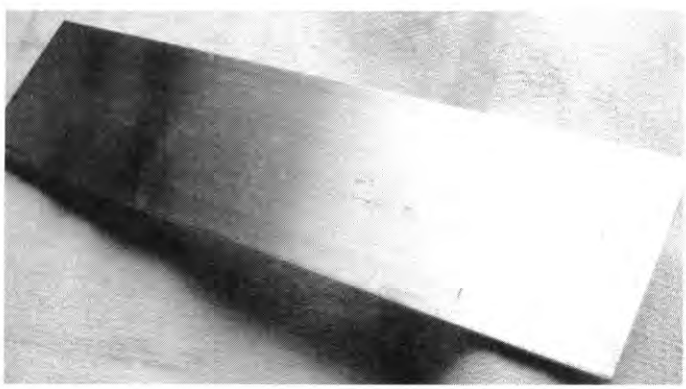
Angle or 'L' shaped aluminum. You'll need three, 11 1/2" pieces. You can also use a thicker (at least 1/4") bar aluminum, but I recommend the angle stuff. It's stronger and lighter (you can get away with 1/16" stuff). You'll need angle that's at least 1 1/2" wide on each side of the 'L'. ☐



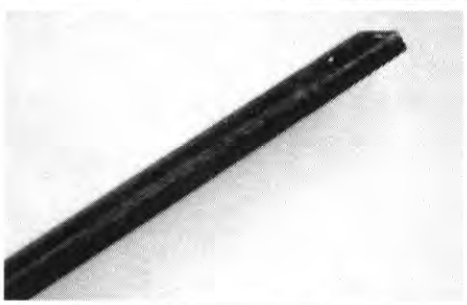
The Top Control Arm. This can be much smaller aluminum tube. Mine is 3/4" square and 1/16" thick. You'll be cutting this down to about 4' lengths as well, plus you'll only need enough total length to reach the control handle. You'll probably need at least 135".



Like the bottom boom arm, you'll need connector bits for your cuts on the top control arm. If you can't find square aluminum bar to fit this smaller square tube, you can use round bar like I have. Again, how many 12" pieces you'll need depends on how many sections you'll be cutting your crane into.



The Camera Plate. This plate is an 1/8" thick by 12" long by 4" wide. Feel free to go wider if you want. In fact, I recommend 6" if you can find it.



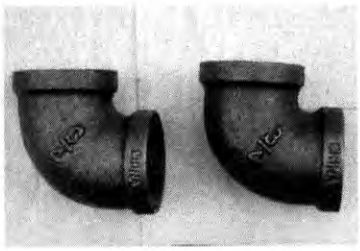
(1) 3 foot long by 3/4" to 1" wide by 1/4" thick steel bar.
DO NOT USE ALUMINUM!



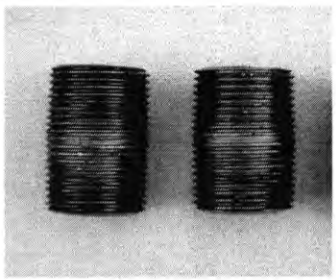
(1) 3" simpsons strong tie L-bracket



(1) 1" plumbing pipe 'T' fitting.



(2) 1" plumbing pipe elbows.



(2) 1" plumbing pipe nipples. Try to find the shortest ones the hardware store has.



(1) 1" plumbing pipe nipple around 3" or 4" long.

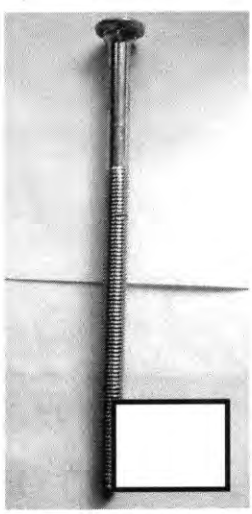


(2) 1" plumbing pipe 9" or longer.



(1) 3' rod OR...

(2) 1/2" carriage bolts by 10" long. You can also use threaded rod. If you want to play it safe, get 3' of the rod and cut it when you find your exactly measurements. Since one of the jobs of this piece is holding your counterweights, you'll need to keep in mind the width (from top to bottom) of your bottom boom arm. You need a bolt long enough to go up through the boom, hold an 8" long pipe or longer, a washer and finally a big nut. Take a look at page 316.



...(2) 10" carriage bolts



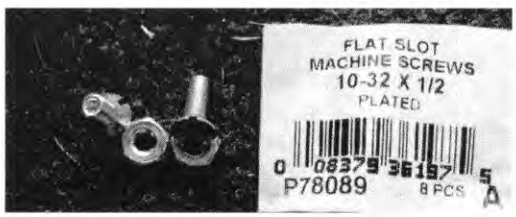
(1) 3/4" by at least 8" long plumbing pipe. This is to hold your weights. If you're making a very long crane over 16' or using a pretty heavy camera, you'll need a pipe longer than 8". Go with 12" to be on the safe side. This also means you'll need a longer carriage bolt or better yet, just go with the half inch threaded rod and cut it. Remember to get a couple of 1/2" nuts for the Rod, or just one if you're using the carriage bolt. See page 316 for more details.



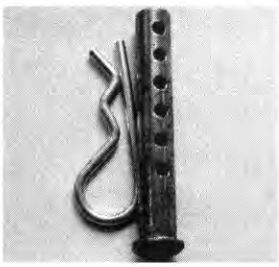
(1) 5/16" eye-bolt. This goes through the steel bar. Get the shortest one they have. Pick up (2) 5/16" nuts for this eye-bolt.



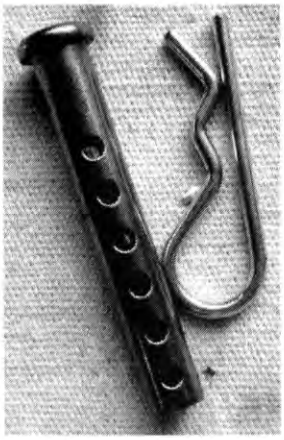
(2) 5/16" eye-bolts, 4 fender washers, 2 stop nuts. These hold the cable, so you'll need the shaft of the eye-bolt to be long enough to go all the way through your the width of your bottom boom arm with enough room for 2 washers and a stop nut. My boom is 1.5" so I'm using bolts with a 2" shaft. WARNING: the measurements on the package of an eye-bolt reflect its entire length, not the shaft length.



(2) 1/2" long flat head screws. These are for attaching the camera plate. Get around 10/32 in size.



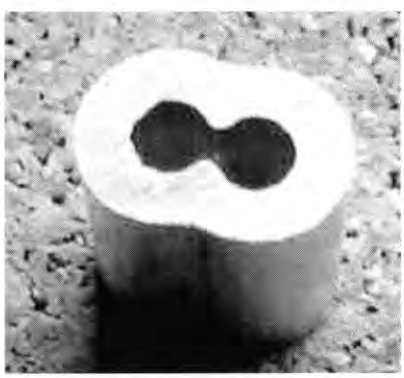
(2) 1/4" Universal Clevis pins with a hitch pin.



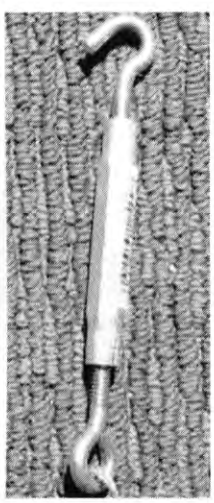
(3) or more 5/16" Universal Clevis pins with a hitch pin. These hold the crane sections together after you've cut it. You'll need one pin for each cut.



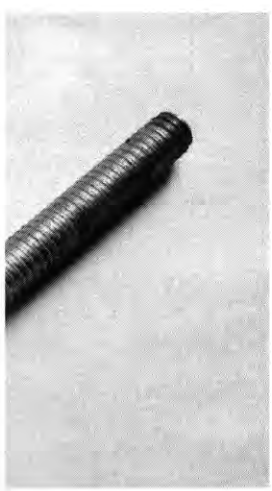
(2) Lengths of cable. I don't know how long your crane is, so I can't tell you how much you need. See page 318 for details. As far as cable thickness goes, go toward the smaller gauge.



(4) Cable ferrels. Make sure you get ones that match the gauge of your cable.



(1) Turnbuckle, 3 to 4 inches long. Make sure that you get one that has an eye-bolt on one end and a hook bolt on the other.



(1) 5/16" threaded rod. If you made the stabilizer, you might have enough left over from that project. Otherwise, buy a 12" length of it.



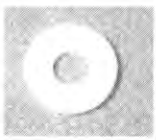
(1) Flat handled knob with a 5/16" thread. On this knob, get one that doesn't allow the bolt to go all the way through. ☐



(1) Round knob with a 5/16" thread. On this knob, the bolt needs to be able to go all of the way through the top. ☐



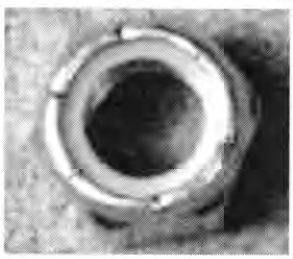
JB Weld ☐



(18) Nylon washers. Get two thick ones fit the 1/2" bolt. 5/16" on the rest. ☐



5/16" bolts. I don't know how long you'll need, so give this a little thought. Make sure that you have enough length to allow for any washers and the nuts. You'll need 2 bolts for each cut section you need to hold together (see page 328). You'll also need 1 bolt for the camera end section (page 319) and 1 for the middle vertical bar section (page 319). ☐



For each 5/16" bolt you get above, pick up a lock nut. ☐



Wing nuts. At least (3) 1/4" ☐



1/4" bolts with nuts. These are for the top control arm. You'll need 2 bolts for each cut section (page 330) and 1 bolt for the camera end section and 1 for the middle vertical bar section (page 320). On one side of the cut section, use a regular or stop nut. On my crane, that means I need 2 nuts. For each remaining bolt, use a wing nut. See above. The length depends on the width of your control arm. ☐

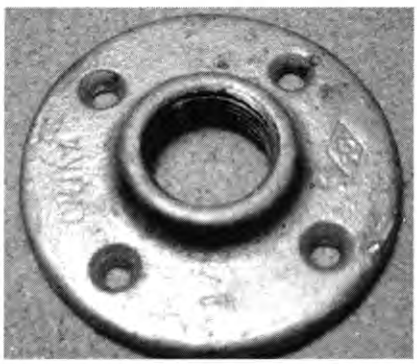
The Handle.
If you want to make one like mine, just follow the directions for the Shock Corridor Stabilizer handle on page 49, but instead of a cap nut, use a 5/16" wing nut. A simpler handle can be made by taking a wood dowel about 5" long by 3/4" diameter and drilling a hole down the length of it.



Materials for the Crane Base



(4) 1/4" nuts ☐



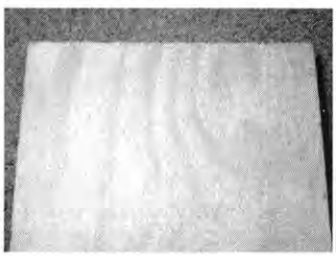
(1) floor flange for 1" pipe. ☐



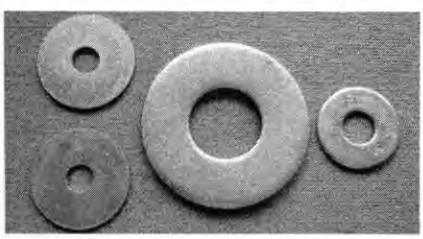
(4) 1/4" x 1" long bolts. These attach the flange to the plywood. ☐



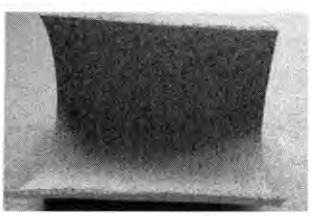
1/2" Wing nut for holding your mounting plate to the tripod. And (2) 1/2" for the cradle. ☐



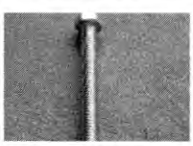
3/4" thick plywood. A 4" square. ☐



An assortment of washers: (2) fender washers. A large mean lookin' washer. And a regular washer just small enough to fit inside the pipe hole on the floor flange. ☐



A small square of thin cork. This will be glued to the 4"x4" plywood above, so get some at least that large. ☐

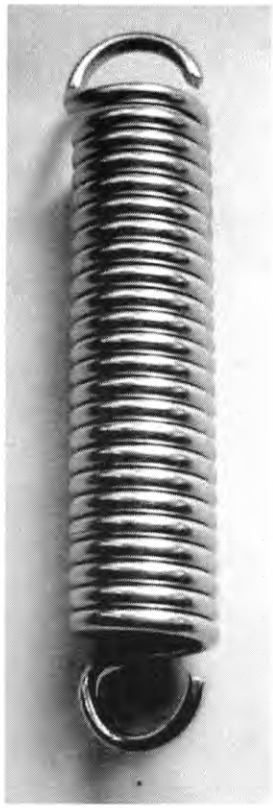


Bolt 1/2" x 3". ☐



(3) 1/2" nuts ☐

MAKE IT GROOVY



(2) heavy springs about 4 inches long. This one is 13/16 x 4 x .120



(2) 5/16" eye-bolts. These go through the the two vertical bars. A half inch shaft is plenty. Get 2 5/16 inch nuts for each eye-bolt.

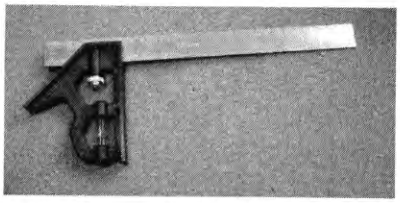


(2) 5/16" eye-bolts with a shaft long enough to go through the width of your bottom boom arm. Get 2 fender washers and 1 stop nut for each eye-bolt.

TOOLS LIST FOR THE BIG CARNIVAL CRANE



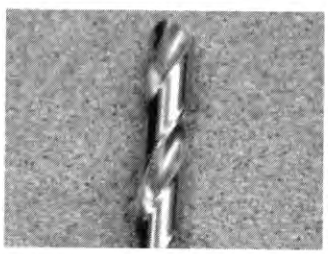
A good assortment of clamps--at least 4 of the type here. ☐



Combination square. ☐



A drill. Get one with "variable speed" ability. ☐

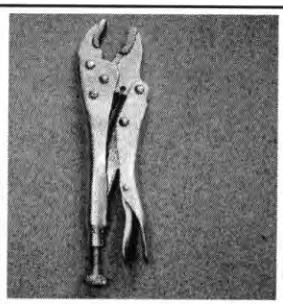


1/2" bit

5/16" bit

7/32" bit

☐



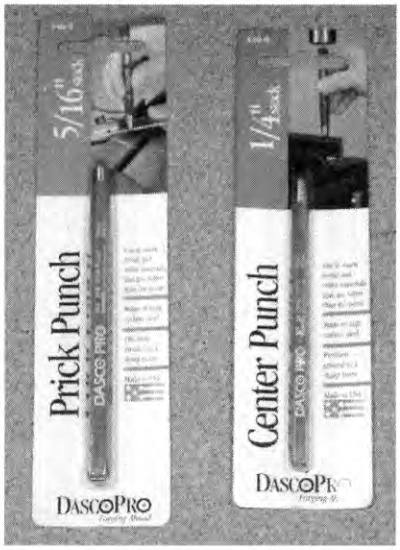
Locking pliers. Maybe two. Or another kind of wrench. ☐



Safety Glasses.
Don't be a chump. Use 'em ☐



Cutting Oil. You use this when drilling into metal. You might want to pick up a little oil can to put it in. ☐



Center Punch and Prick Punch.

A **Center Punch** is used to put a small dimple in metal where you're going to drill a hole. You have to have this or your drill bit will "walk" across the metal, and that's not good at all.

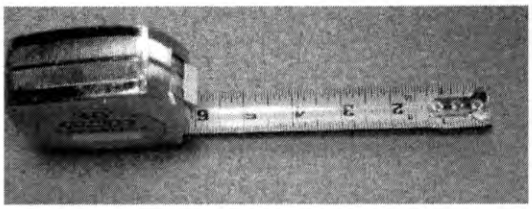
The **Prick Punch** scratches into the metal for marking (a pencil comes off too easily).



If you don't have a drill press, I really encourage you to get one of these. It's a handy drill guide, and will keep your holes straight and true--very important in this type of work. It also has a V in its base to hold a round piece of pipe for perfect center drilling (something we do alot around here.) It runs about $35 bucks. A good investment if you build more than one project in this book.



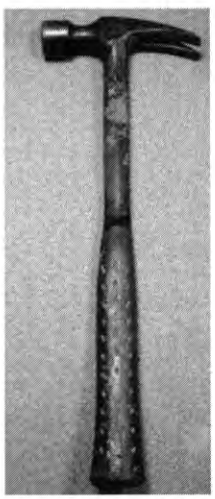
Vise. gotta have it. I found this one at OSH for $9.95, so the investment is minimal. Mount it on your bench or a heavy piece of plywood.



Tape measure

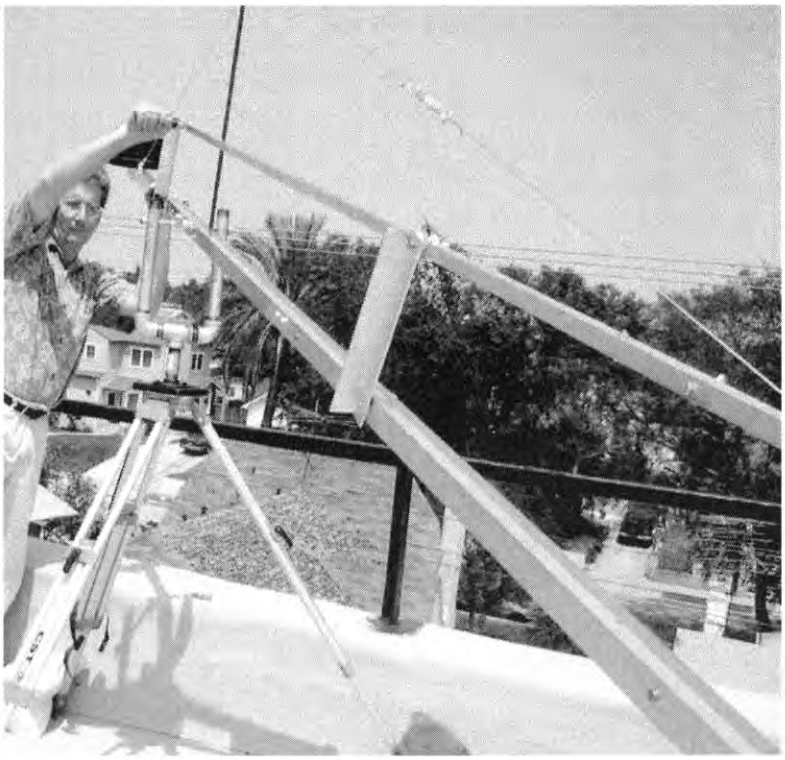


Hacksaw. Get extra blades that have 4-16 teeth. (A soft metal like aluminum doesn't like any more than 16 teeth.)

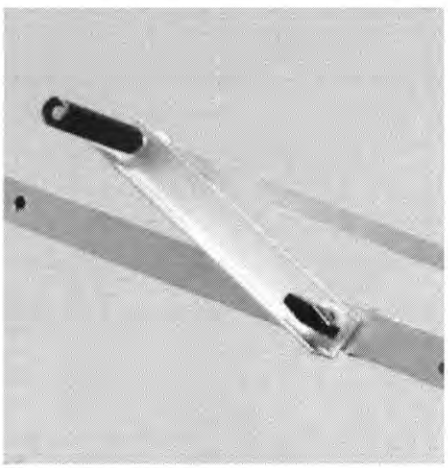


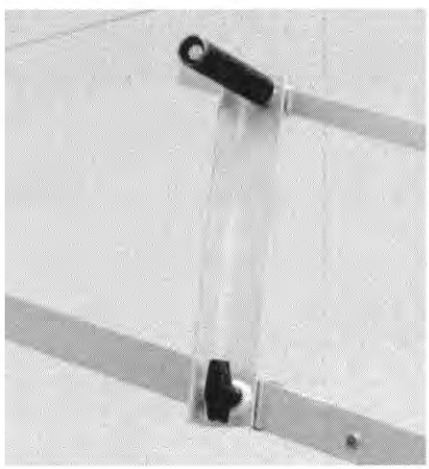
A hammer for thwacking

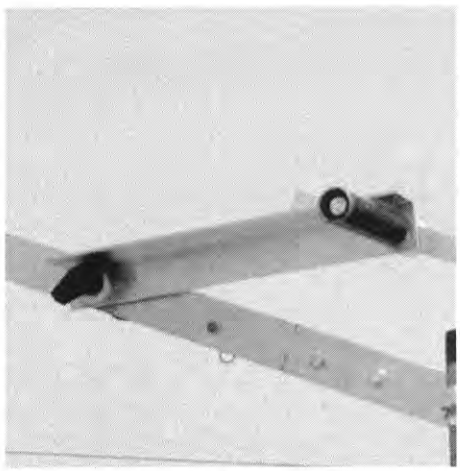
Before we start building, let's look at the working of the Big Carnival Crane.



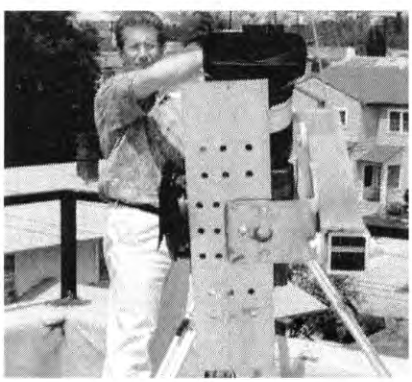
At first glance, it looks like the Big Combo: a big support arm on the bottom that carries all of the weight, and lighter top arm.



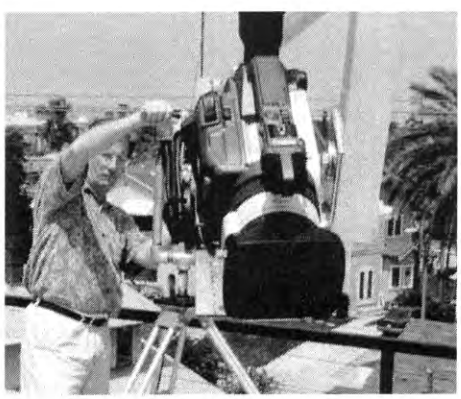




The difference is that the top bar moves, allowing you to tilt the camera.







The obvious question is why not just stick a wheel on the front like the Big Combo and be done with it?

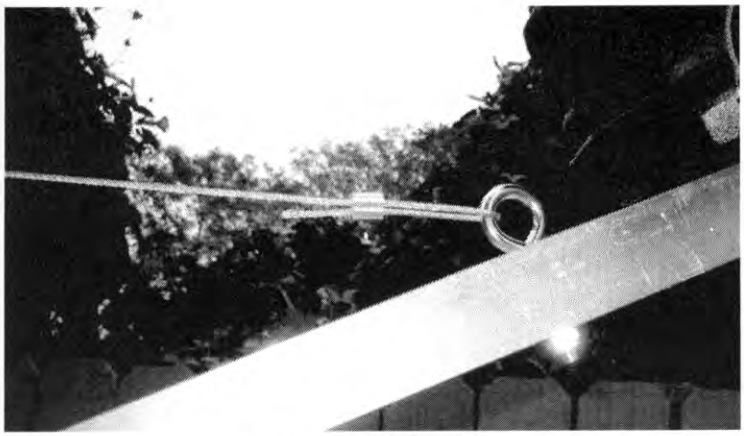
You can certainly do that, and is a very viable option. Just forget the top arm altogether and go for it.

Here's why I didn't: first, because the wheel design uses a belt to tilt the camera instead of gears, it has a higher learning curve for smooth operation. The Big Carnival doesn't take as much skill to operate. Second, you can lock the top bar into any position, and not have to deal with tilting through the move at all. I use this more than I ever thought I would. And third, by tightening the pivot bar bit by bit, you can increase the drag on the top tilt bar to suit your own taste.



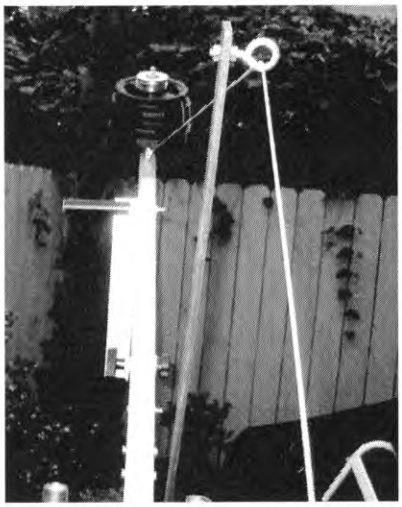
Hey! What's that cable that runs the length of the crane?

When a crane gets as long as this, it needs some support to keep from wobbling. If it were shorter, or the aluminum was thick as my mom's devil's food cake, you could get by without the support cable. But what fun is that?

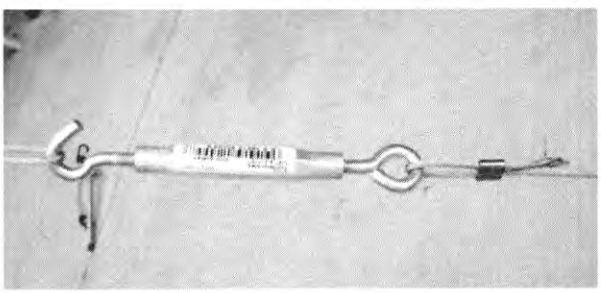


Here's how it works:

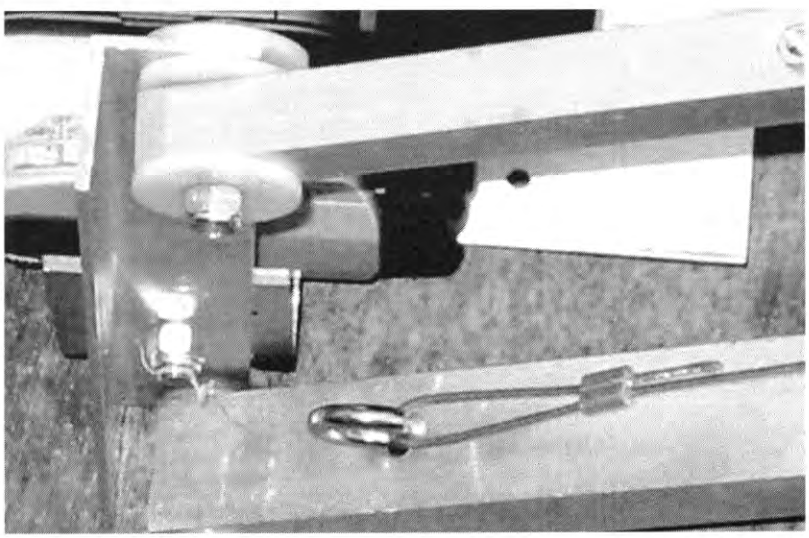
The support cable hooks up to an eye-bolt near the weights...



...goes through an eye-bolt attached to a long bit of steel, that is attached to the bottom boom around the pivot point...



...a turn-buckle is attached in the cable run for tension adjustments...



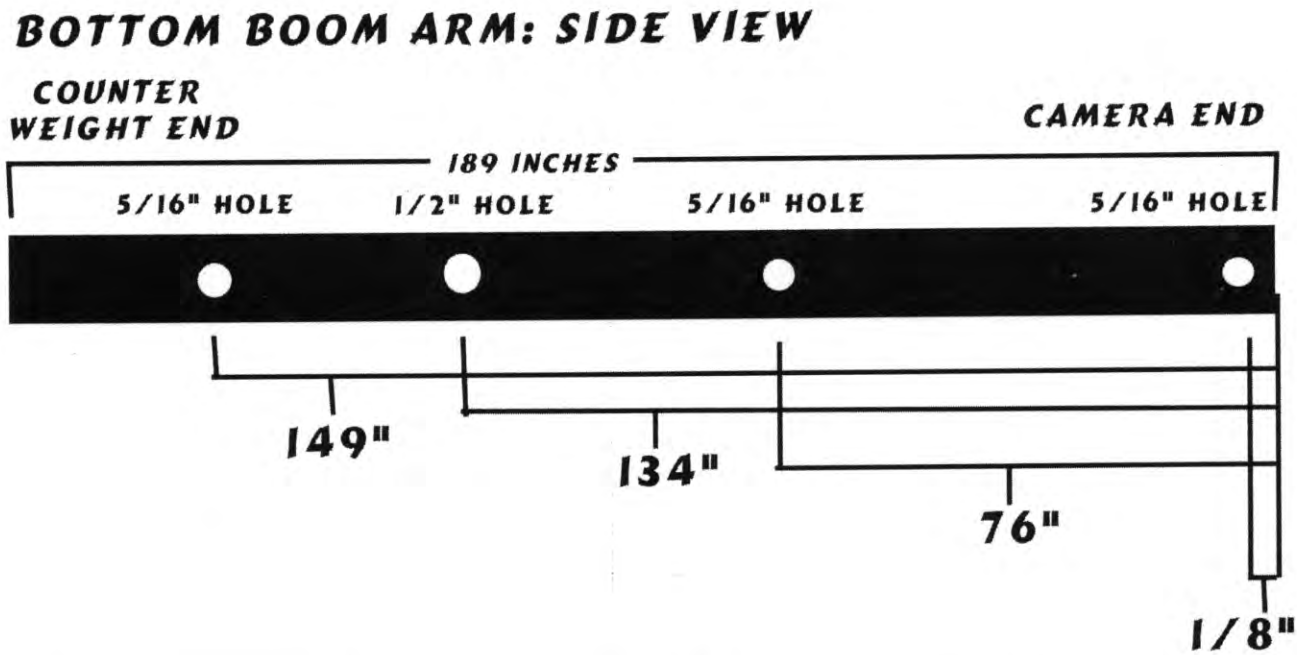
...and finally ends at another eye-bolt on the camera end.

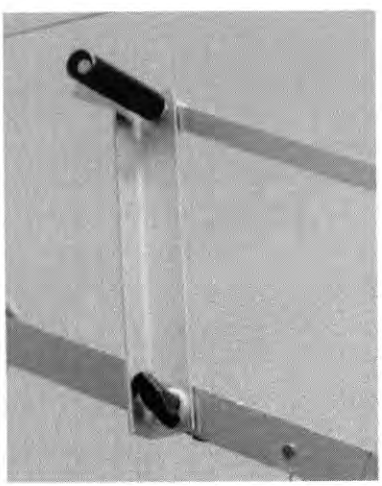
Voila! No more vibration! It's a miracle!

Let's Build It

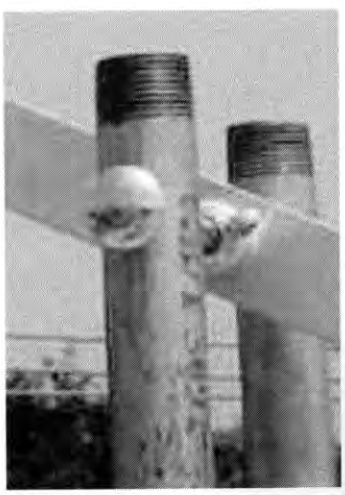
As I mentioned in the introduction to this chapter, since there is detail in drilling holes for cranes in the Big Combo section, I'm just going to show you where and what size holes you need for this crane. If you're building the Big Carnival first, please refer back to the **Big Combo** plans for detailed instruction on construction techniques.

Take a look at the graphic below. If you're looking at the crane from the side, here's where you'd drill your holes on a boom 189" long.





The hole at 149" from the camera end is for the tilt control.



The 1/2" hole at 134" is for the support from the tripod.



The hole at 76" is for a vertical support for the top arm.



And at a scant 1/8" is a 5/16" hole that holds the camera vertical bar.

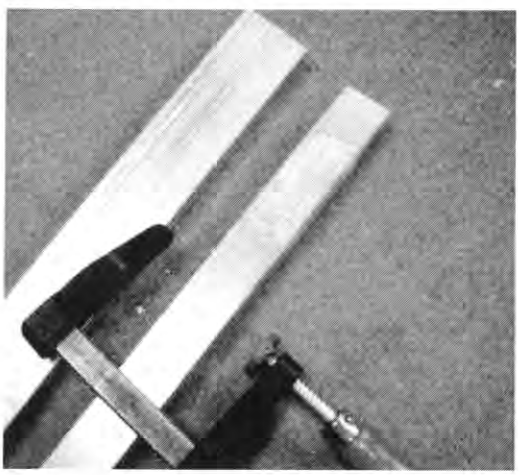
With the exception of the camera vertical bar hole at the tip of the boom arm, these measurements are just a guide. Put the tilt control where it's most comfortable for you. Just keep in mind that the support cradle for the entire crane is very close by, so make sure you put the tilt handle where it's not going to clonk into the crane support half-way through a move.

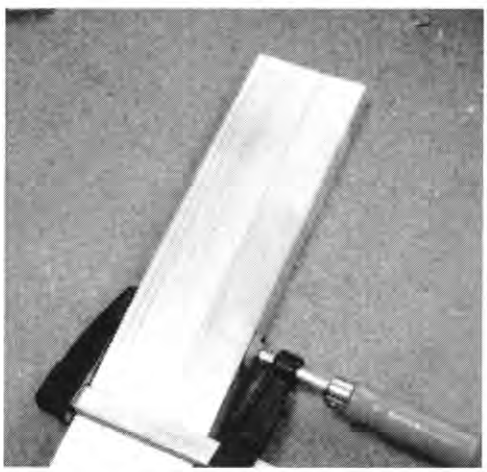
The other hole to keep in mind is the big 1/2" hole for the support. It needs to be around a third up from the weight end. So if the boom length is 18', you'd want to drill the hole somewhere between 5 and 6 feet from the weight end.

Hey! How long does the top arm need to be?

It needs to reach from the camera end (exactly, please) to a few inches beyond the tilt control. Check out the graphic for the Big Combo crane on page 97.

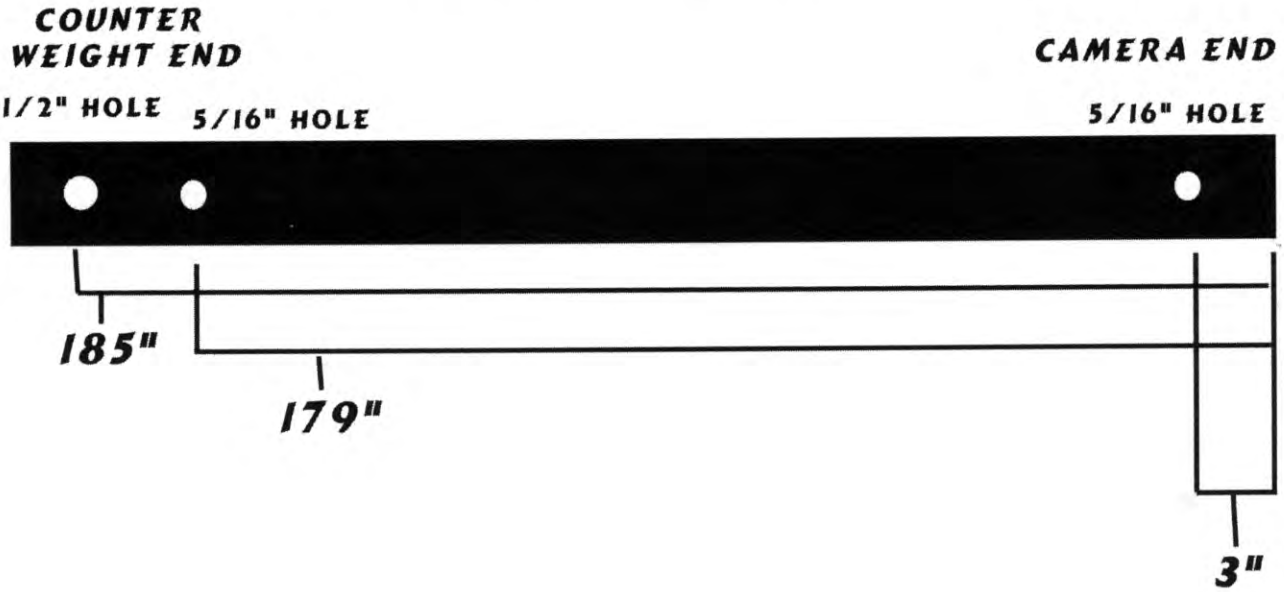
1.





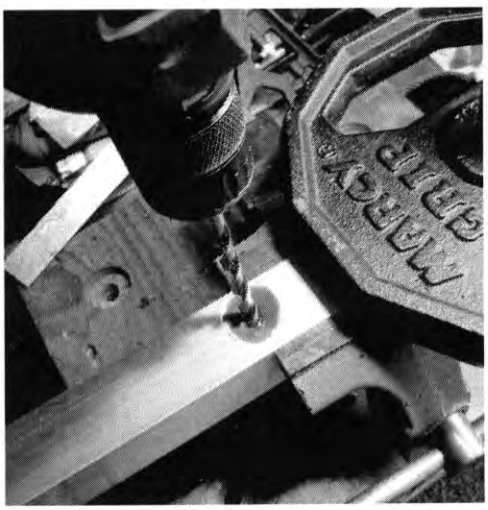
As with the first crane in this book, clamp the top and bottom arms together, mark where the holes go with the prick punch and combination square and drill away. This way, the holes on both arm will be in exactly the same spot. All the holes on the top arm at this point are 5/16". And make sure they are dead center on the aluminum on both bars. Again, study the techniques on building the Big Combo Crane. It's all the same stuff. Refer back to the chart on page 304 and drill all of your holes for the side of the crane.

BOTTOM BOOM ARM: TOP VIEW





The 1/2" hole at 185" is for your weights.

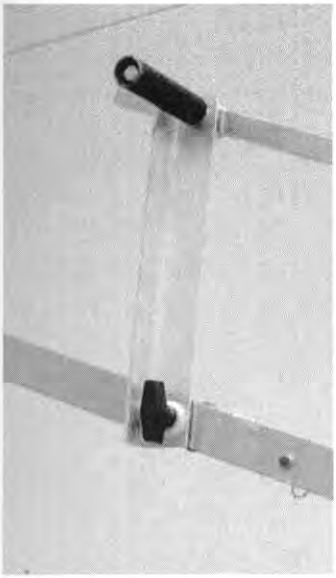


The 5/16" hole is for the back eye-bolt. Make sure you drill this one far enough away from the 1/2" hole so the largest weight you have doesn't hit the eye-bolt once it's installed.



The 5/16" hole at 3" is for the front eye-bolt.

The Camera plate and vertical bars.



There are 3 vertical bars that connect the top arm to the bottom arm. I'm using 1/8" thick 'L' shaped aluminum. You could use a thicker flat aluminum bar if you want, but the 'L' shape carries a lot of strength.

2.



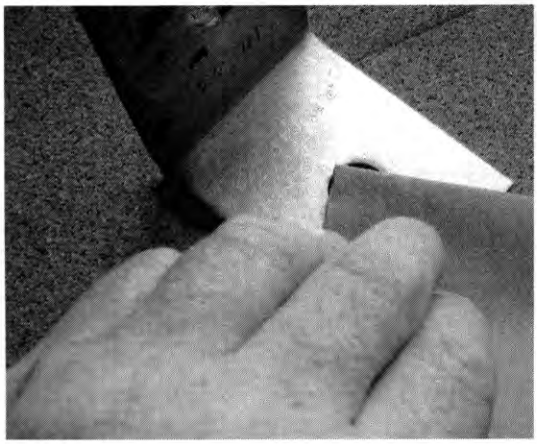
Cut three bars at 11 1/2 inches each.

In TWO of the bars, drill a 5/16" hole in the MIDDLE of one side of the 'L'. Drill two holes: one hole 1" from the bottom and the second 1/2" from the top.



On the third bar, only if your using 'L' shaped aluminum by the way, drill the 5/16" holes a 1/4" from the EDGE. Not in the middle as you did with the above 2 bars. It's this bar we'll be using for the camera mount.

You also want to add a hole to hold the camera bracket. Measure up 3" from the bottom of the 3rd aluminum bar and drill a 1/2" hole in the MIDDLE of the bar on the same side as the other two holes.
If you're using a flat bar, you can put all the holes in the center.

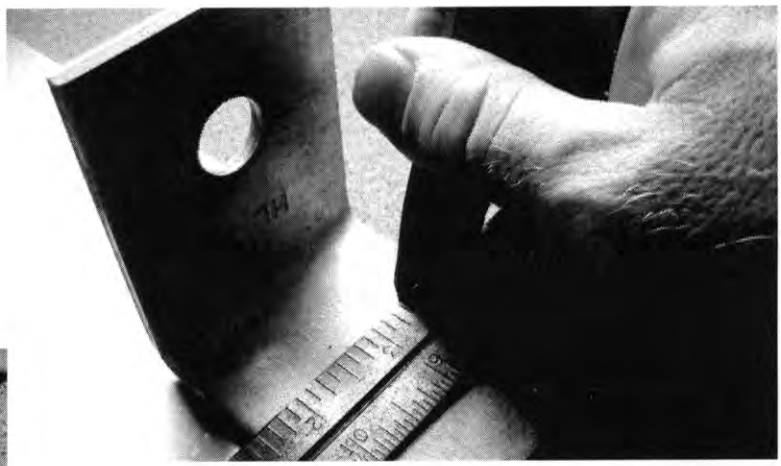


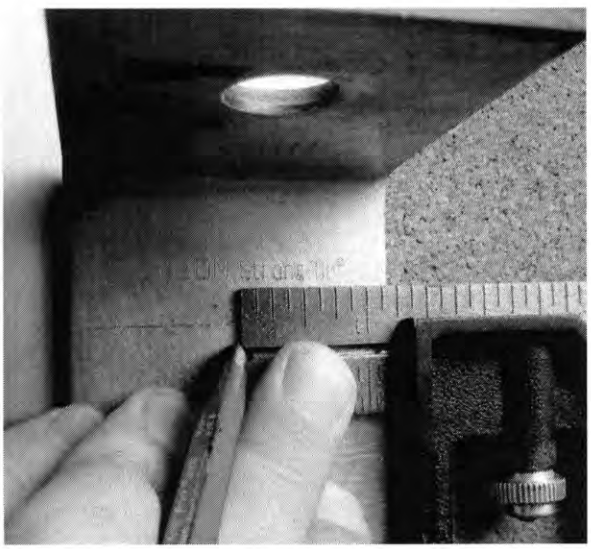
The Camera Bracket:

3.

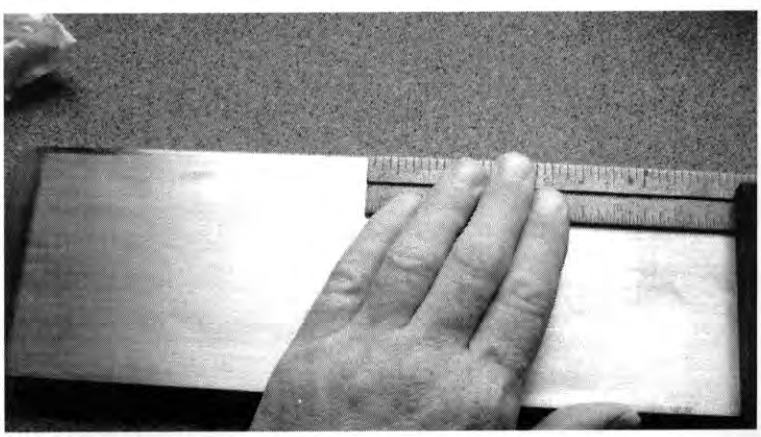
Like on the other crane, use a Simpson Strong Tie 'L' bracket. We're going to be JB Welding an aluminum plate to the bracket, so sand the baby down and clean it for a good stick 'um surface.

Before we glue the plate on the 'L' bracket, draw a line across the bracket to mark where the edge of the aluminum plate will go. Make sure your line is square with the edge of the bracket.

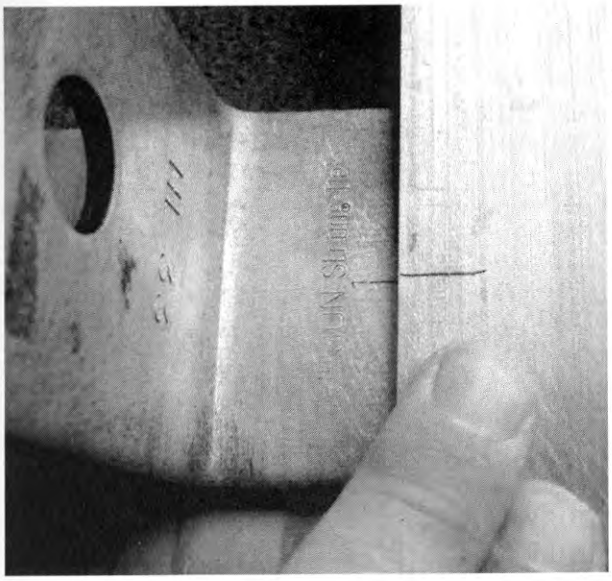




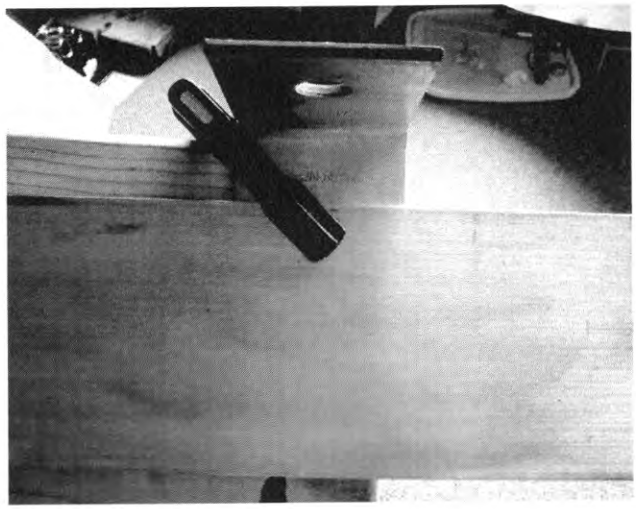
Draw another line crossing the first, marking the dead center of the first line.



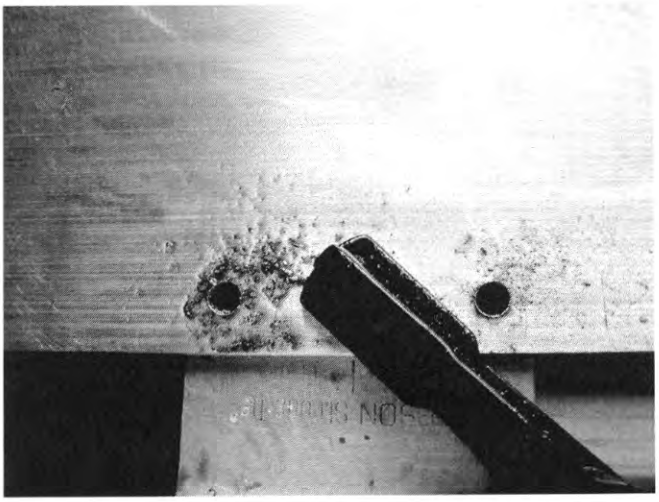
Mark the middle of the aluminum. I'm using a 12" long piece, so that's a mark at 6". I always was a whiz at math!



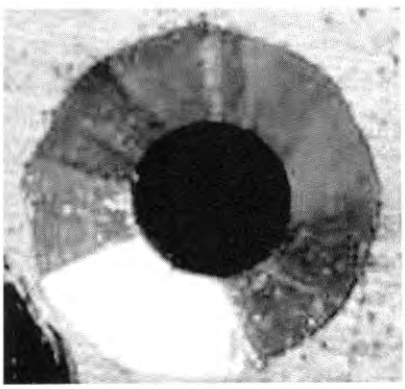
Line up the 2 middle marks on the two pieces...



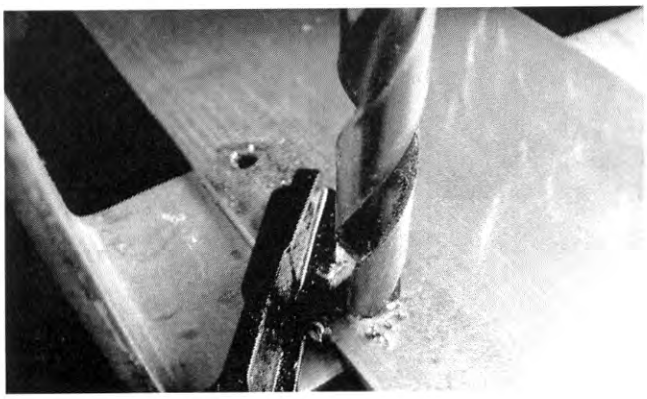
...then clamp both lined up pieces onto a bit of scrap lumber.



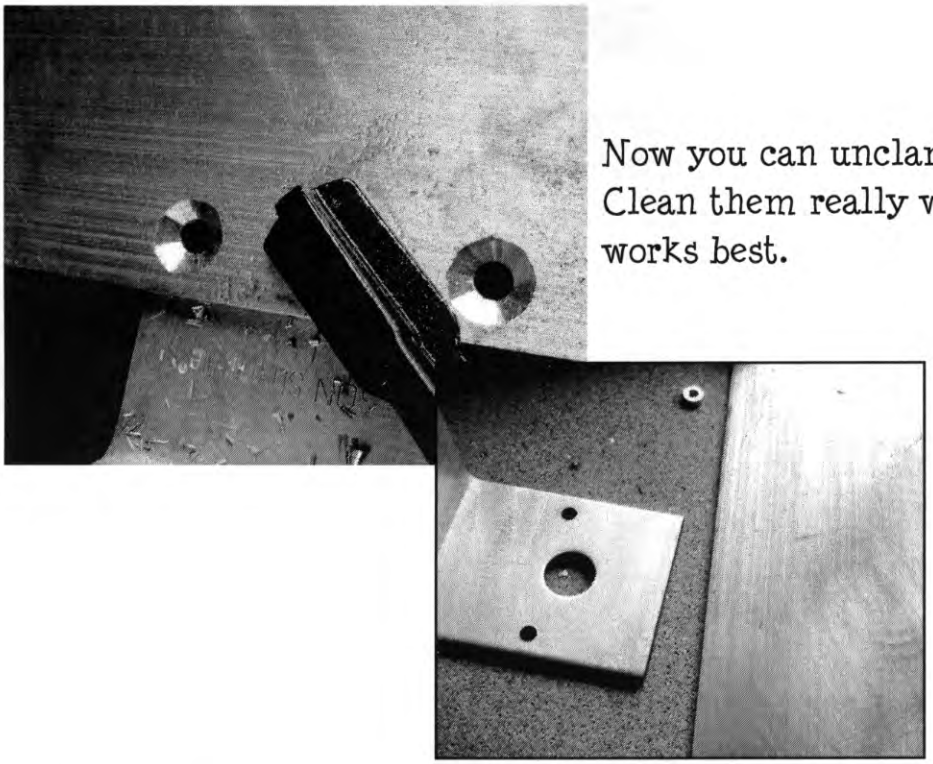
Drill a couple of holes through both pieces near the L-bracket edges. I'm using a 7/32" bit.



Use a half inch bit to taper the holes you just made. Go slow and stop when it looks like the photo on the left.



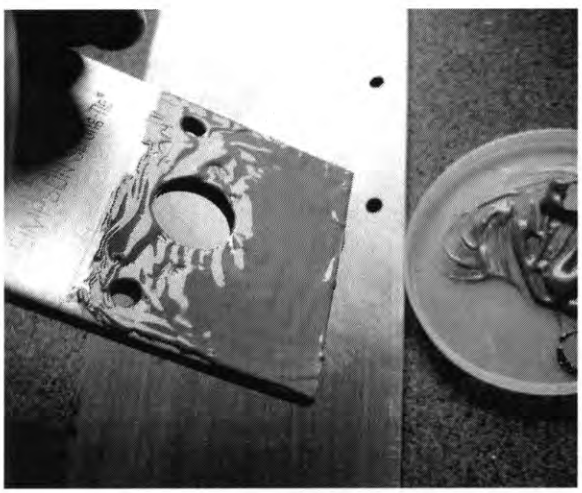
4.

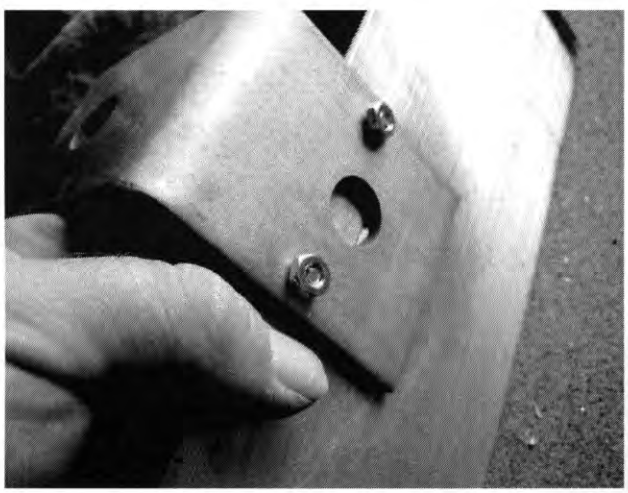


Now you can unclamp the pieces. Clean them really well. Acetone works best.

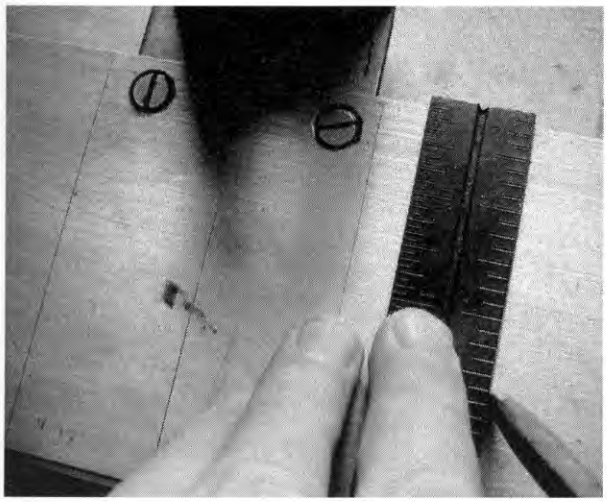
Mix up some JB Weld and glue the plate to the L-Bracket.

Use the flat head screw and nut to attach the plate to the bracket. Set it aside until the JB Weld dries.





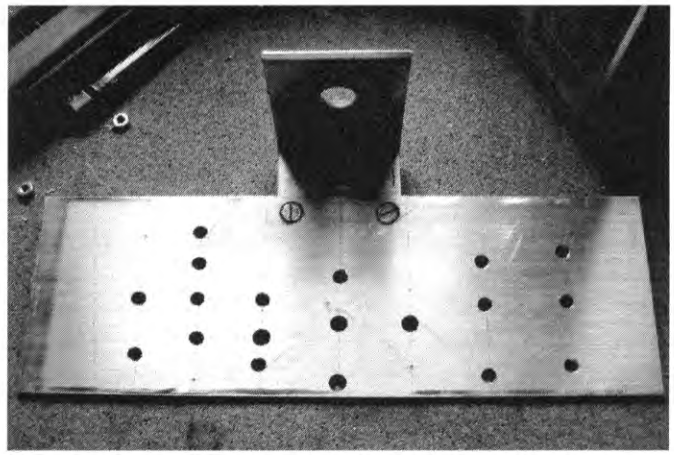


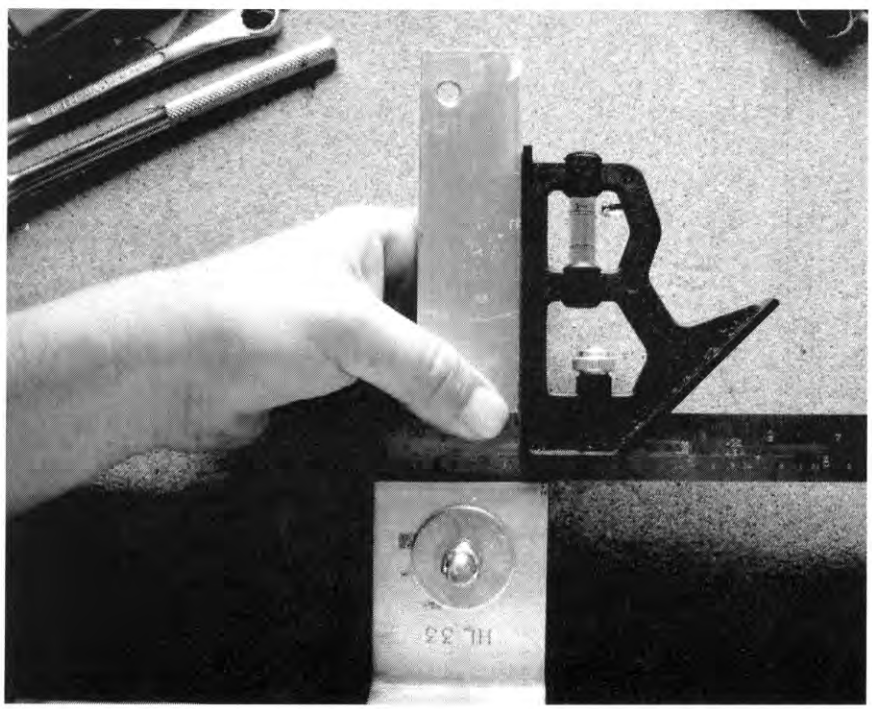


Draw some lines across the camera plate. You can be as imprecise as you want. We're just going to drill some holes for the camera screw.

5.

There. That should take care of any whacky camera I might come across. Did I over do it? Heck yeah! There are a few holes near the center that I used a 5/16" bit because we're going to be putting a 16mm camera on here where I have the option of using a bigger camera screw. The rest are the usual 1/4".





Take your camera plate and bolt it onto the L-bracket through the 1/2" hole. Use a 1/2" bolt and a couple of washers to do the deed. I also added some JB Weld onto the back of the bracket before tightening down the nut.

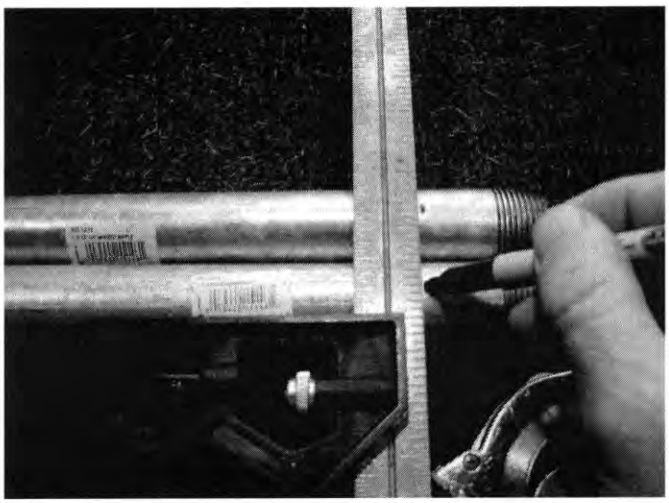
IMPORTANT: Use your combination square to make sure the bracket is square to the aluminum angle.

The support cradle for your crane. This cradle is a huge thing, different than the other crane. Why? Because this is one big freakin' crane, that's why!

6.



Take your 1" plumbing pipes and lay them side by side.



Use the combination square to mark the pipes at the same point on each. Go about 1" down from the end.

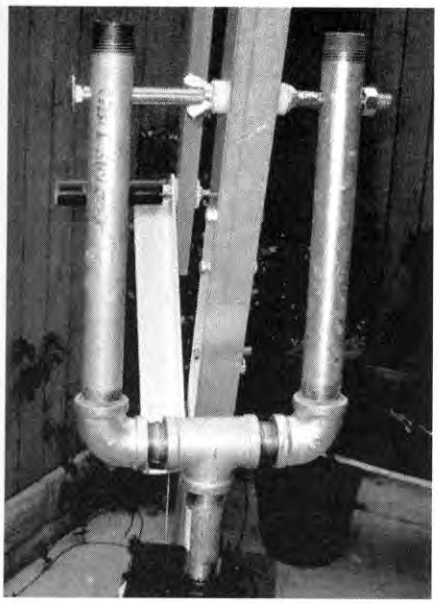


Drill a pilot hole on each pipe at the mark. Use around 1/4" bit to start. You can try using the 1/2" bit only, and do this in one pass, but that's a lot of steel to take out at once, so I really suggest making this pilot hole first. Go through both sides of the pipe.

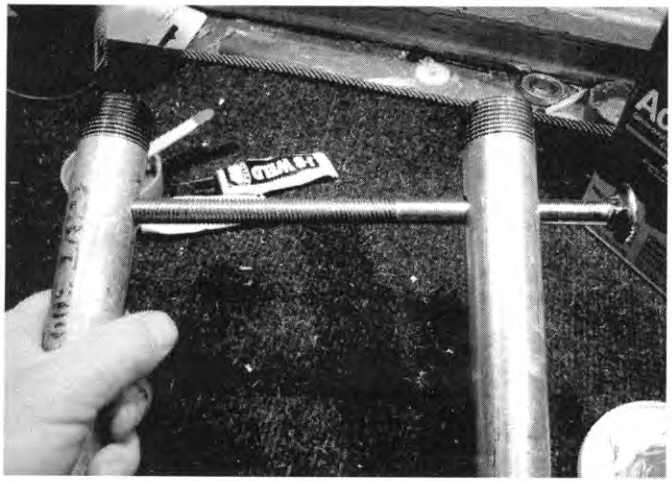
Now drill a bit 1/2" hole at the pilot hole all the way through the pipe. Make sure you go slow and use plenty of cutting oil.

Repeat this on the second pipe as well.





Put all the plumbing pipe together to look like this (minus the crane and cross bolt).



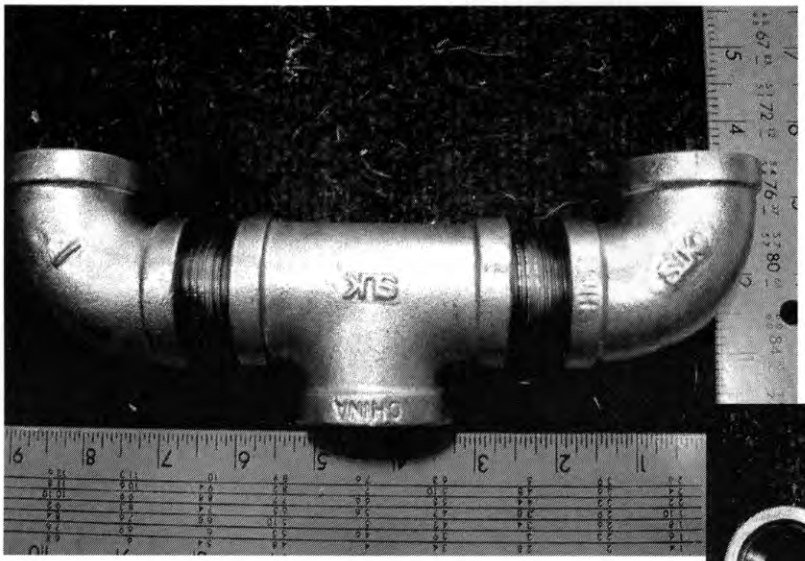
Make sure the holes line up so you can put the 1/2" bolt through there, and the bolt rests perfectly straight across.

If everything is hunky-dory, use JB Weld to make this one solid piece.

7.

Mix up the JB Weld and coat the threads...be a little quick with these next steps. You don't want the Weld to start to harden.





Make damn sure the elbow joints are pointing exactly the same!





Coat the threads on the two long pipes...



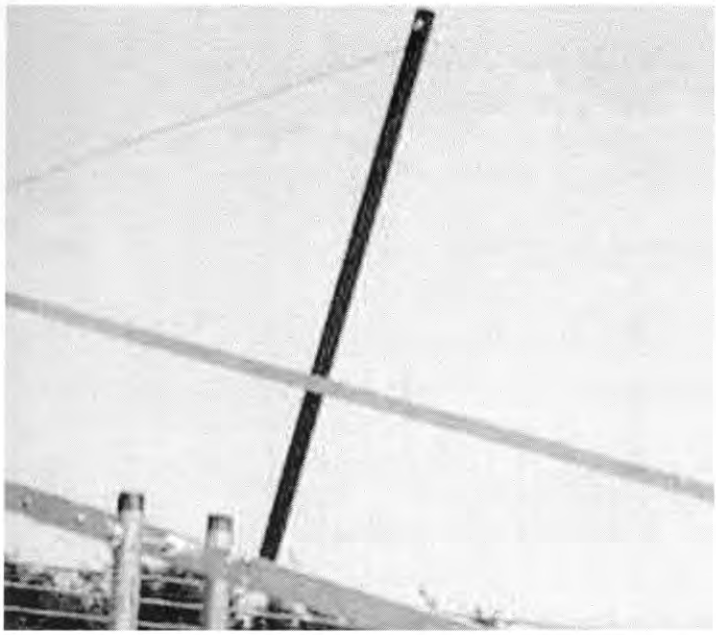
Use a big wrench to tighten those babies in there.



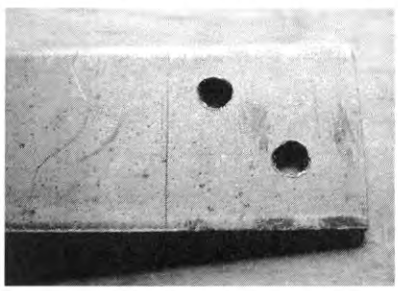
Quick! before the weld dries! Run the bolt through the holes and make sure everything is square. Make it perfect!

OK, now we're going to take care of the steel bar business that holds the cable to keep your crane from wobbling.

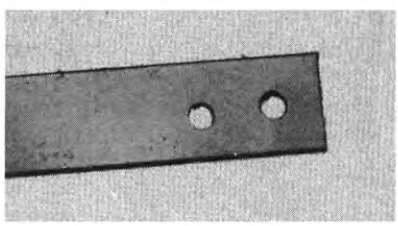
8.



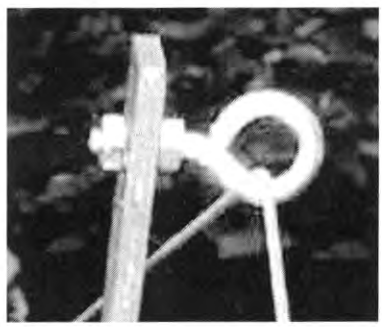
We're going to be drilling a 5/16" hole in the top to take an eye-bolt, and two 1/4" holes in the bottom to hold the bar to the bottom boom arm, then drill holes in the boom arm to hold the bar.



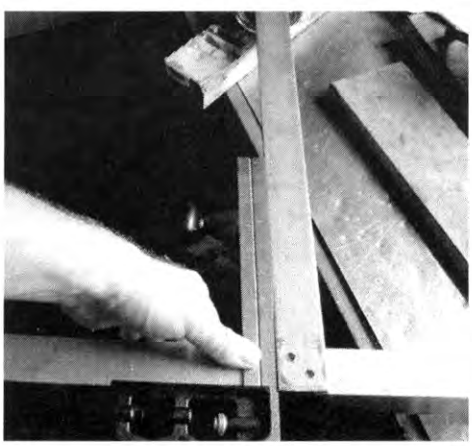
Drill two 1/4" holes within the side width of the bottom boom arm. I've two examples here. Take your pick.



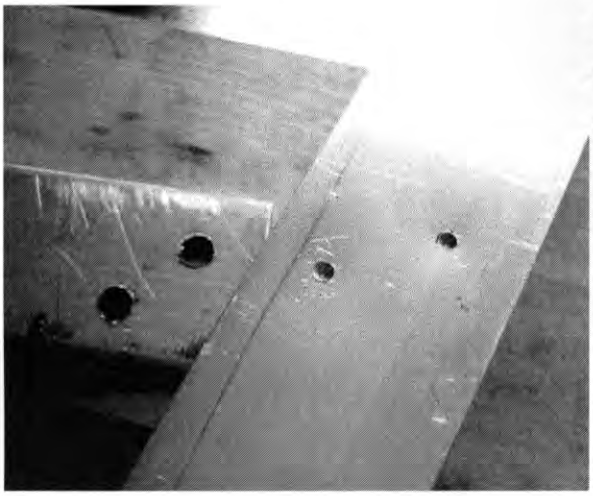
Drill a 5/16" hole an 1" from the top for the eye-bolt.



9.

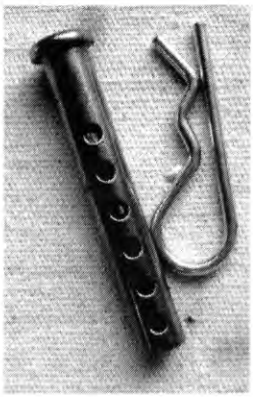


Set the steel bar on the bottom boom arm at around 6" toward the camera end from the 1/2" hole that holds the bolt of the cradle. (Take a close look at the photo at the top of this page). The two 1/4" holes should be over the boom arm. If you drilled one of them too high, drill another. That's OK. I'll wait. Use a combination square to make sure the bar is going straight up from the boom before you mark where you'll be drilling the holes.



Mark the boom where the two holes on the steel bar end up, and bang a couple of dimples in there with your prick punch.

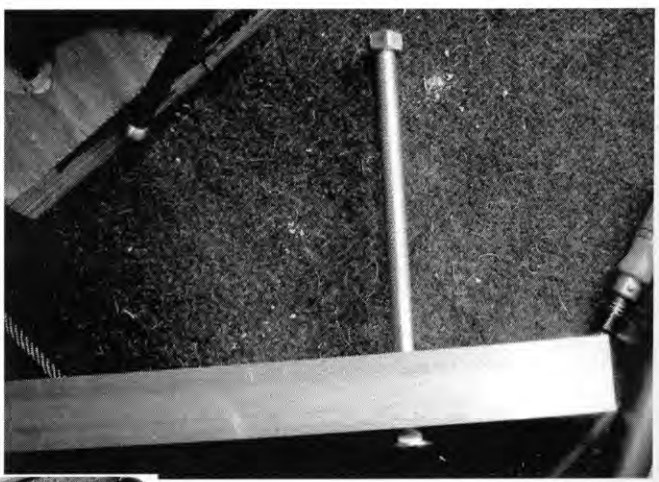
Drill a 1/4" hole all the way through the boom on both marks.

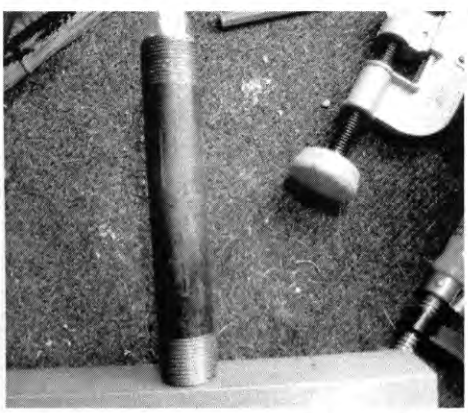


Use a couple of Universal Clevis pins with a hitch pin to attach the arm when the time comes.

10. The weight end.

Slide a big 1/2" bolt up through the hole at the weight end of the boom. If you're using the **threaded rod** for this part and a longer pipe, put a stop nut on the end of the rod, slide it up through the boom, slide the pipe over the rod, hold a half inch nut and washer against the rod, and make a mark above the nut. Cut the rod at that mark.







You can do one of two things for the arm that will hold the counter weights: a 3/4" section of plumbing pipe, or cut some aluminum tube you may have left over from another project.



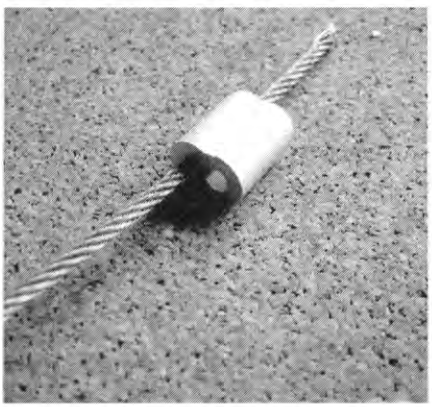
Put a good thick washer (no bigger than the diameter of the pipe, please), over the bolt and muscle a nut down to tighten everything into one solid piece.

And look at that. A nice place to stack weights.

11.

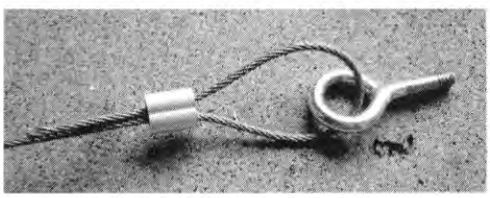
Now, before we go slicing this thing up to make it smaller, let's put it together to make sure it works like it's suppose ta.

First we'll attach the cable to the eye-bolts. You should have 2 lengths of cable, and if your measurements are different from mine, you'll have to run the cable through the set-up already attached to the crane to get your measurements.

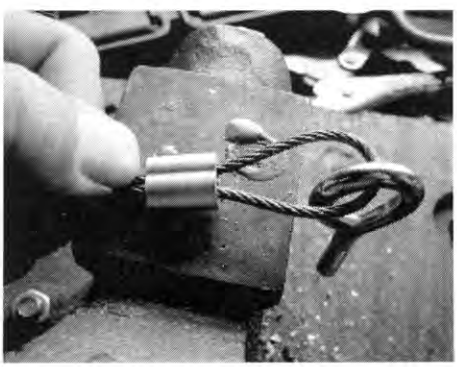




Slip one end of the cable through the ferrel, then through the eye bolt.

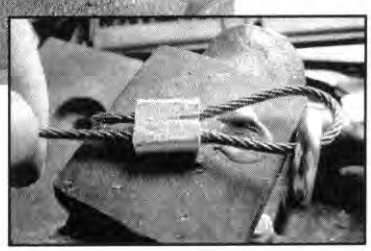


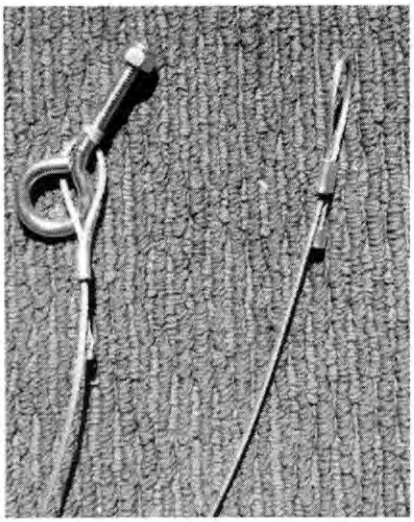
Next, slip the cable end back through the other hole...



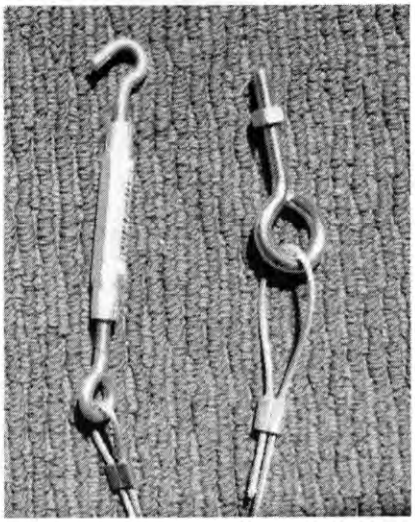
...set the hole mess on a hard surface and bang the pajeezus out of it with a hammer.







The first length is 104". This length counts the eye-bolt end, and the opposite end that just makes a simple loop.



The second length is 77". One end loops through the eye-bolt and the other through the eye-bolt on the turnbuckle.

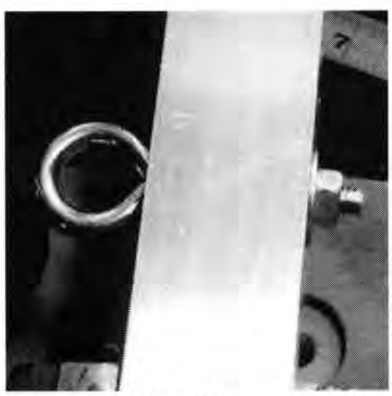
NOTE: These cable measurements include the cable it takes to make the loop, and are based on my crane measurements.

If you need to cut the cable, it can be really tough. I use the cutting part of the vise grips for the job. A better way to do this is to build the crane, then use a string to get exact lengths and have the hardware store cut the cable for you.



This is what the turnbuckle will look like when the cable is in use on the crane.

So let's assume you don't have your cable yet.

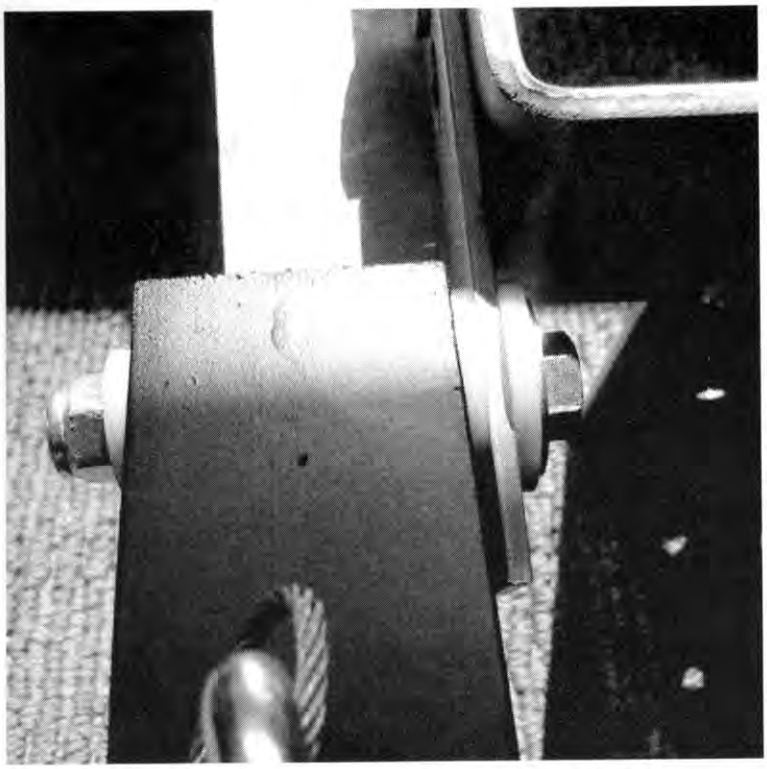




Put one of the eye-bolts through the 5/16" hole near the weight arm. Add a washer and bolt and tighten that baby down.

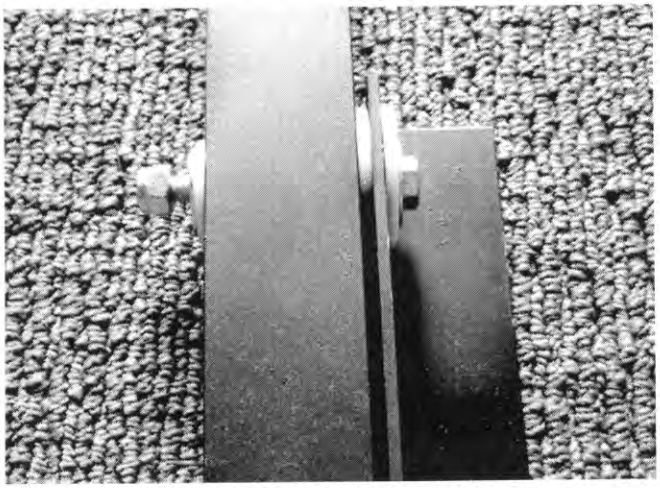
Repeat the process at the front hole near the camera end.

12.

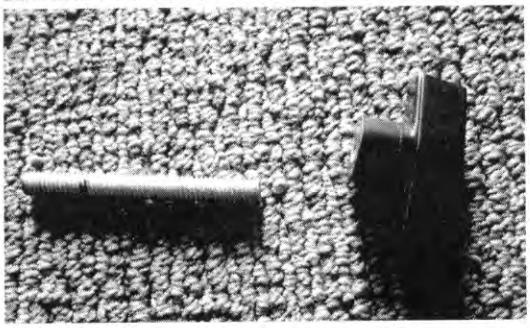


OK, time to put on the vertical bars. Let's start with the camera mount.

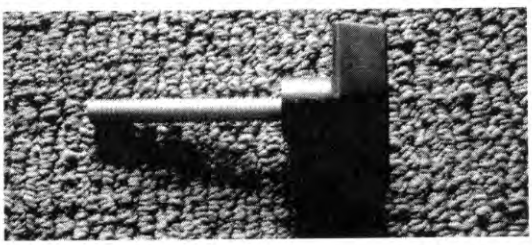
Take a look at the photo: you need 3 nylon washers (AKA, "spacers") a bolt and a stop nut. Don't make it so tight that the bar won't move. It has to be able to rotate, but not so loose that it wiggles back and forth.



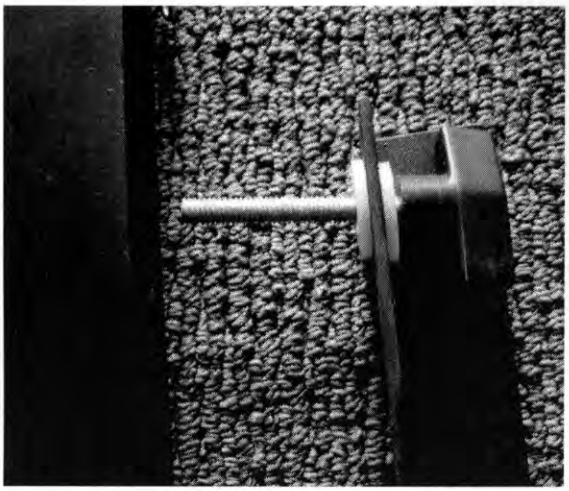
Do the next bar in the 5/16" hole in the middle of the boom. Use the same method as above.



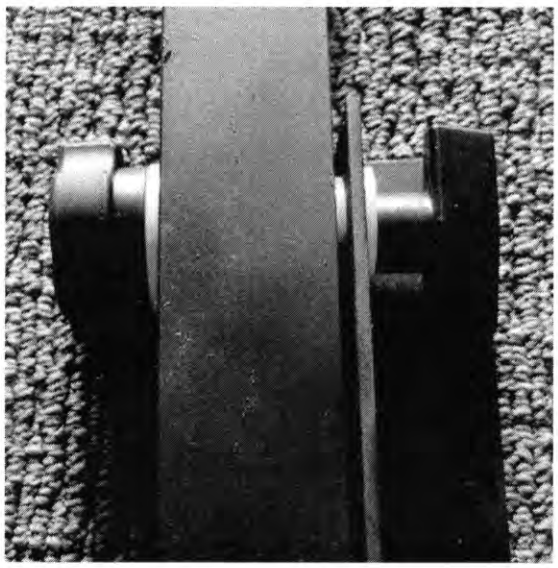
Cut the 5/16" threaded rod long enough to screw into the flat knob all the way, go through the boom with a couple of nylon spacers and vertical bar, and have enough left to screw on the round knob.



Take the length of threaded rod and screw it into the flat handled knob all the way.



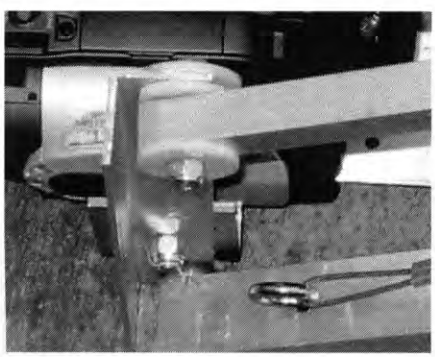
Thread it through the hole and the vertical bar with a nylon washer between each piece of metal.



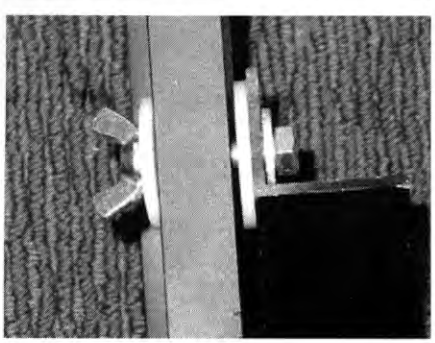
Add another washer and the round knob to hold it to the bottom boom.

13.

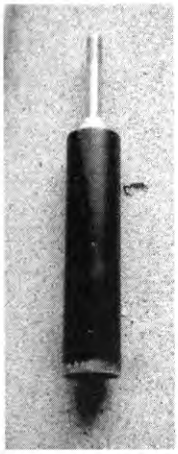
Add the top control arm:



Like the bottom, put a nylon washer between any metal and add a nut. To save time, if you're going to make this crane to break down into smaller bits, you might want to add a wing nut instead of a regular nut as pictured.

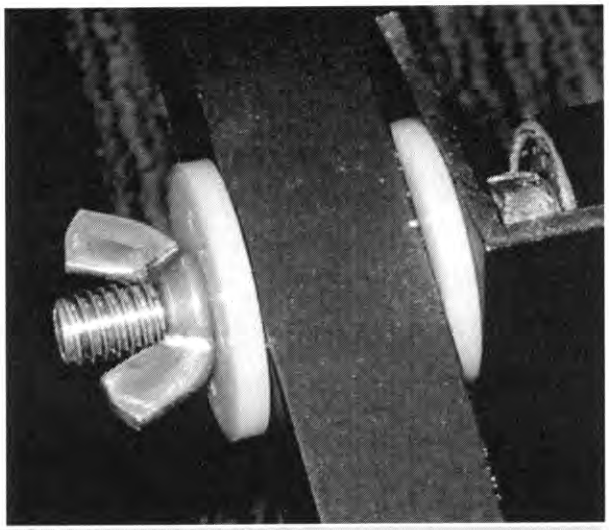


Here is the middle vertical bar attached to the top control arm.

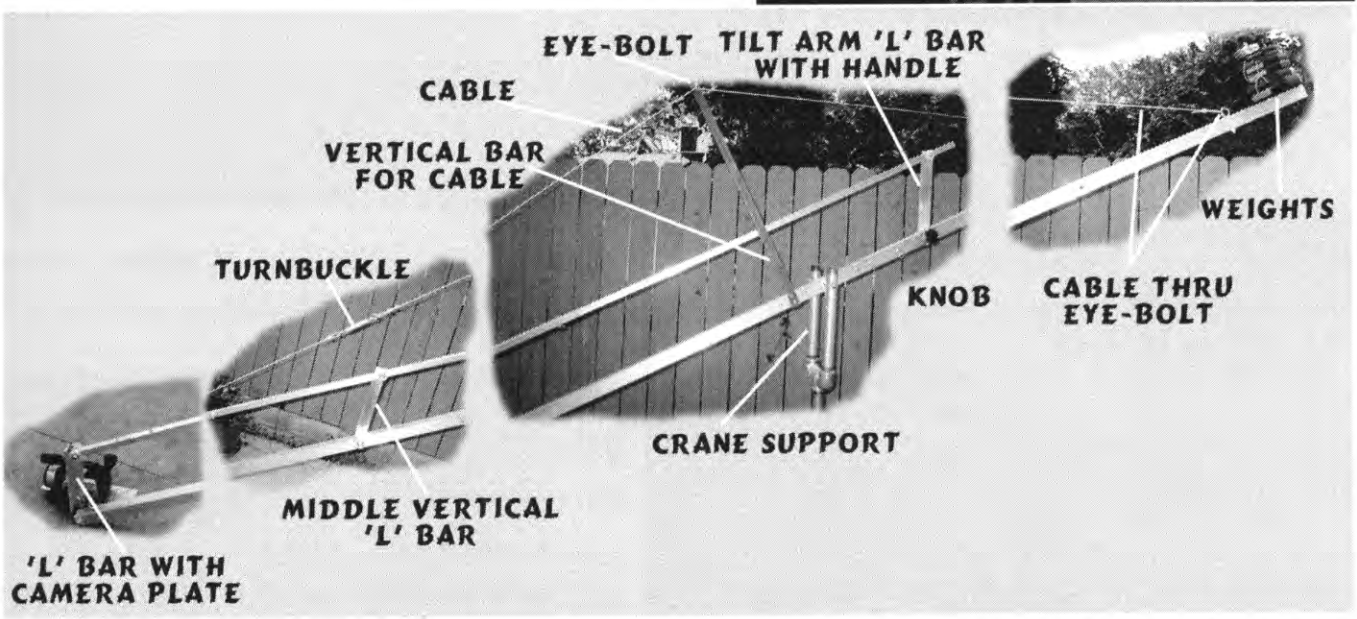


The last vertical bar will hold the handle. I've used the Shock Corridor Stabilizer handle, but your handle could be as simple as a dowel with a hole drilled down through the length of it.

Add a bolt long enough to go through the handle, the vertical bar and the control bar with room for a nut. You can also use threaded rod instead of a bolt.



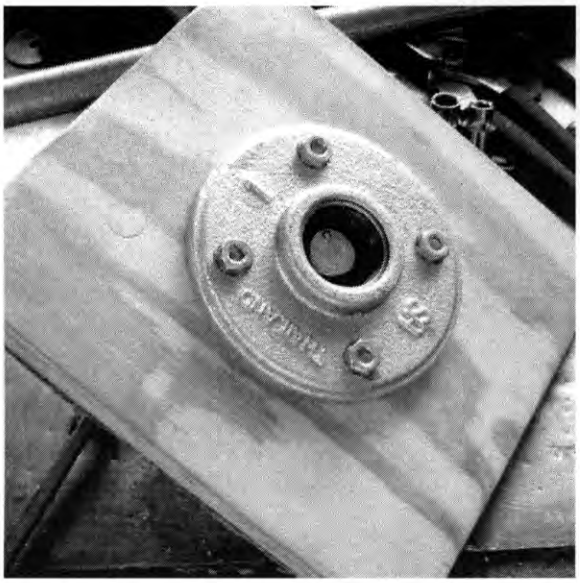
I'm going to attach the top bolt with a wing nut, because when I want to break the crane down into sections, this makes things much easier. On the bottom, I'm using a stop nut because I'm not taking the vertical bar off. You can also make the handle point to either side. Whichever is most comfortable for you.



These might be a good time to take a step back and look at all of the elements that make up this puppy. Does yours look kinda like this? Hope so.

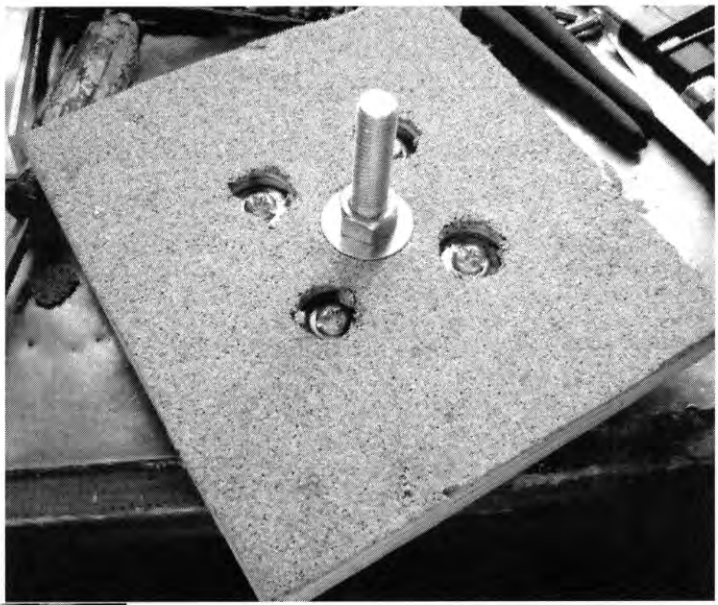
OK, let's make the gizmo that attaches the crane support, or cradle, to the tripod.

14.



The mount we're going to use to mount the crane to the tripod is the same as the Big Combo Crane. The instructions for building it can be found on page 105. There is one important exception...

With a crane of this size, it's VERY IMPORTANT TO USE A HALF INCH BOLT to attach it to the tripod.

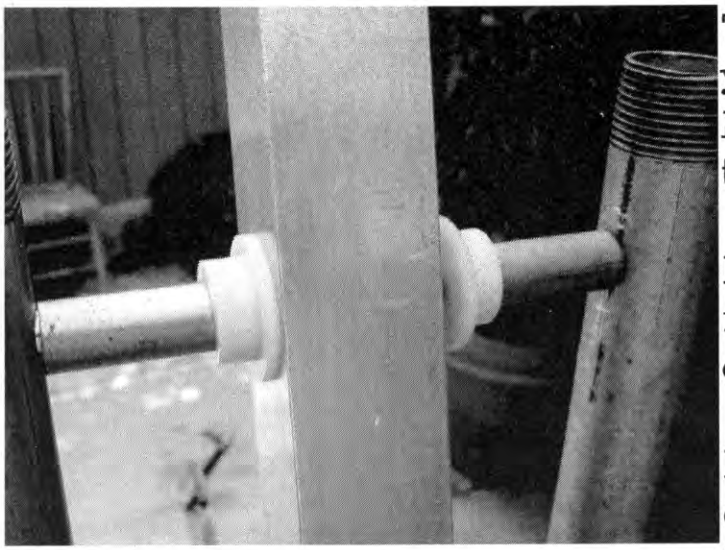




OK, let's put this baby together. Then we'll work out where to cut it into haul-able bits.

Attach the crane mount to the tripod. See page 107. Tighten it down tight! And make sure your tripod is level! Sand bag it, too!

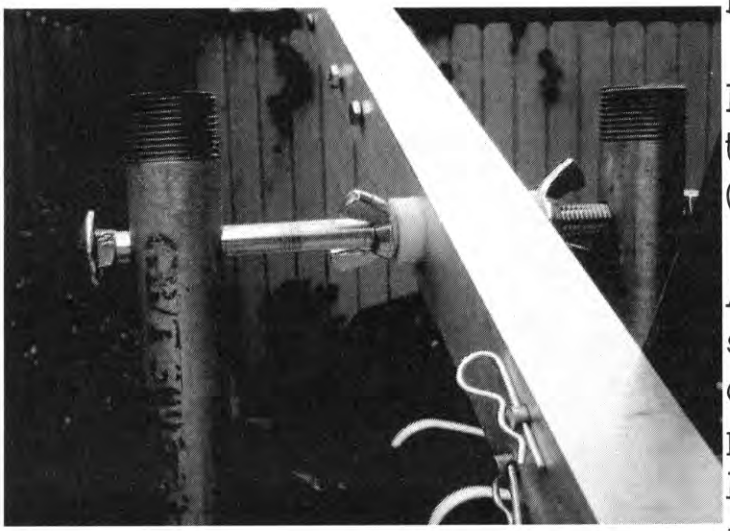
Screw the cradle into the flange on the tripod mount.



There are a couple of ways to keep your crane in the center of the cradle bolt, and therefore, over the center of the tripod. VERY IMPORTANT!

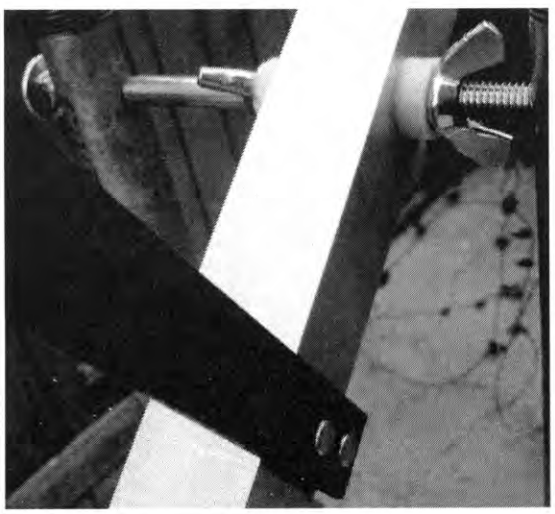
In the top photo, I'm using a combination of nylon and steel spacers on either side of the boom arm.

In the bottom photo, I have a couple of big wing nuts with nylon spacers keeping everything tidy.



I prefer the wing nuts because I can tighten those babies down to increase (or decrease) drag.

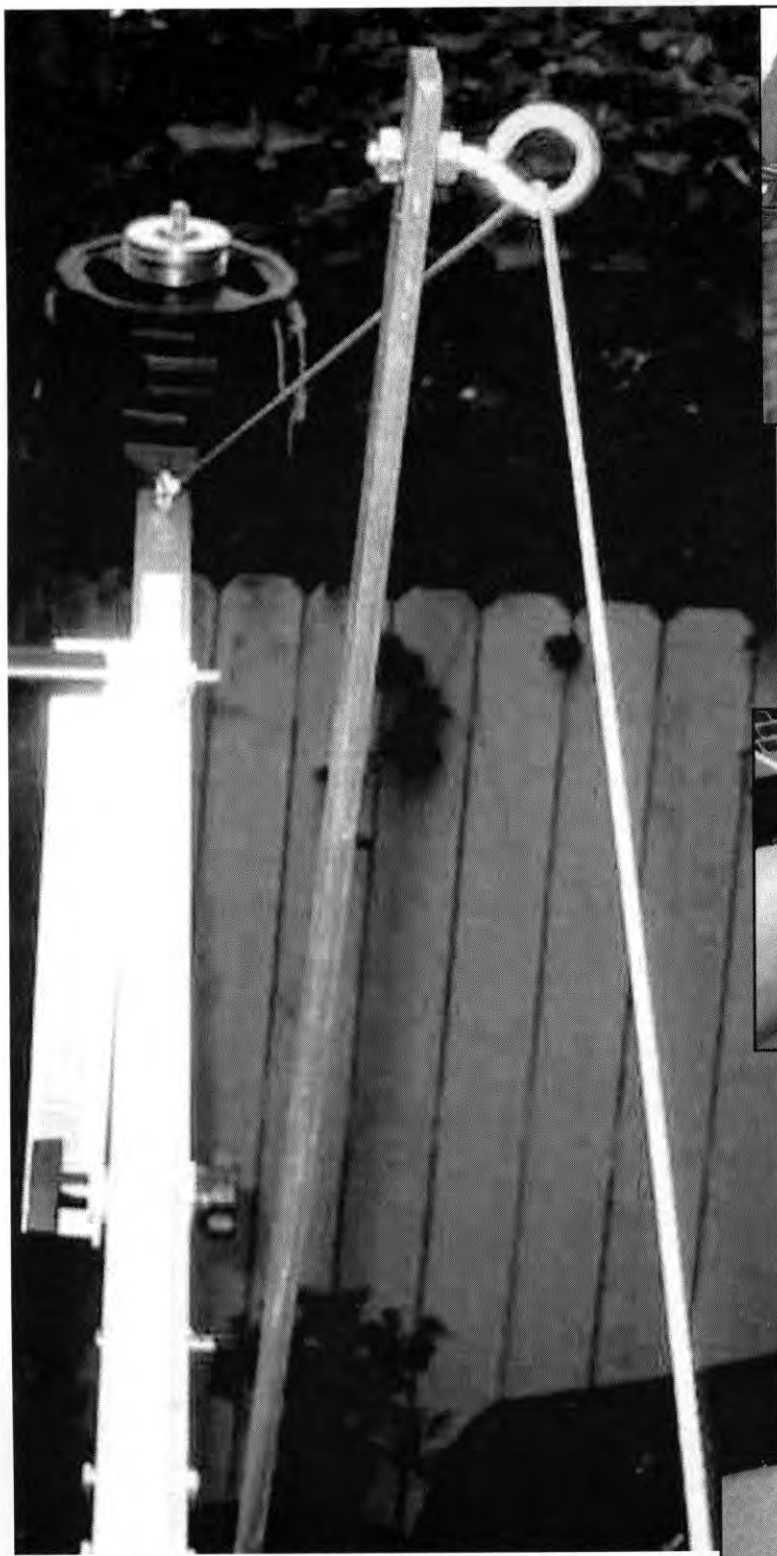
Assembly is pretty straight forward: slide the bolt through one side of the cradle, add a wing nut with the wings pointed outward. Screw it on a little beyond the center point and add a meaty nylon spacer. Slide the boom arm on through the 1/2" hole, add a spacer, a wing nut, and screw the big bolt through the other side of the cradle and add 1/2" nut.



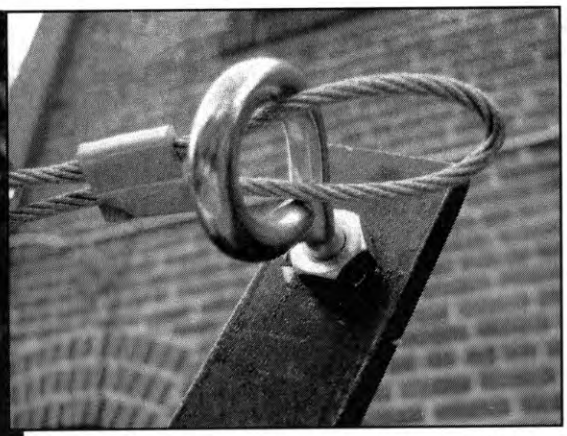
Next add the steel bar that guides the cable.

Use 1/4" Clevis Pins to attach it.

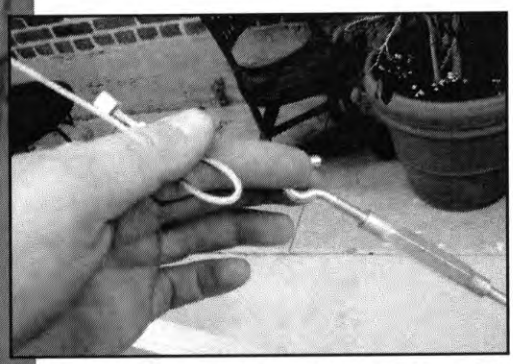




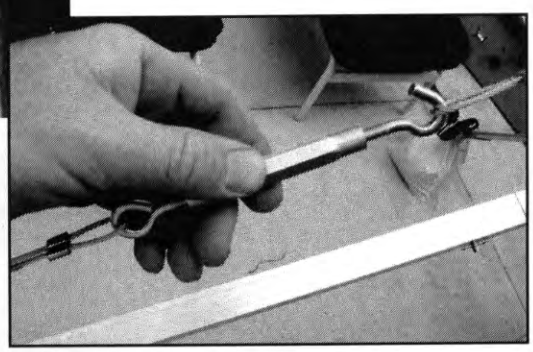
Twist the turnbuckle until you take up the slack in the cable.



Run the cable from the weight end up through the eye-bolt. (Remember, the eye-bolt should be pointing to the outside of the crane.



Hook the cable through to the turnbuckle coming from the front of the crane.

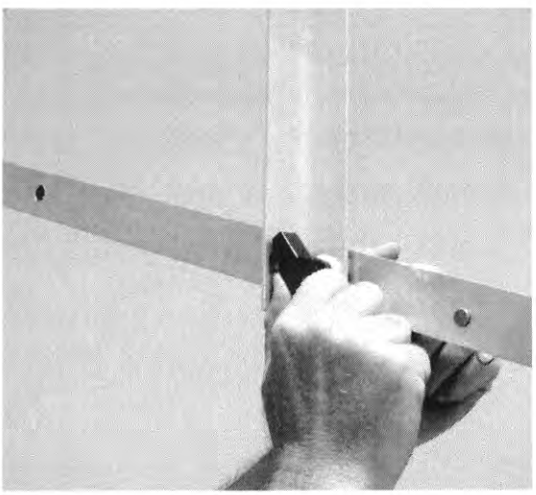




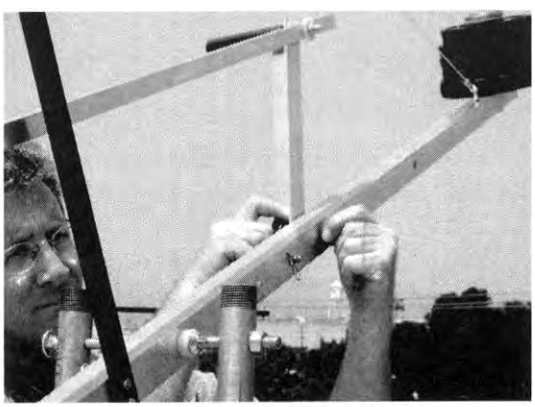
Slap some weights on the back and try it out. Leave the camera off for now and get a feel for the thing first.



I've found that one of the best ways to use this crane is to keep your arm that controls the tilt fairly stiff as you move the crane up and down. This allows for a more smooth tilt.



Another thing you might want to try is to monkey around with the tension, or drag, on the tilt by loosening or tightening the knobs at the base of the tilt arm.



So, pretty cool, huh? Like all cranes, it takes a bit of practice to get a smooth tilt, but I think a little less practice is needed than the tilt wheel on the **Big Combo Crane.** The disadvantage of this crane over the **Big Combo** is that it has no static mount--which requires no skill at all.

OK, now that you've seen this baby in operation, let's chop it up into little bits.

Making the Big Carnival Crane More Portable

OK, I want to keep my crane lengths under 5 feet once broken down. You can make yours shorter or longer. Since my bottom boom arm is 16 feet, I'm going to cut four, 4' lengths. The top control arm will be around three, 4' lengths. Keep in mind, that the crane doesn't need to be cut in exact lengths, mine just worked out well that way.

While the crane is still all in one piece and put together, run a tape measure down the length of it and see if you can divide it into equal lengths. The reason you may not be able to do this is because your cut line may fall too close to where something is attached--like the handle part of the tilt arm, or the crane cradle. You need the cut point PLUS at least six inches on either side of the cut point without hitting an existing bolt.

We need 6" because we're going to attach the crane back together using a 12" aluminum bar that extends 6" on either side of the cut.

So, with all that in mind, mark up your boom arms at somewhat even spacing.

NOTE: if you're like me, you're not going to buy the aluminum for the booms in one big length. I dig through the remnants pile at the metal store to save a bit of cash. So you can do this "chopping up the boom arm" section first. Just make sure you keep all the instructions for building the crane up to this point in mind.

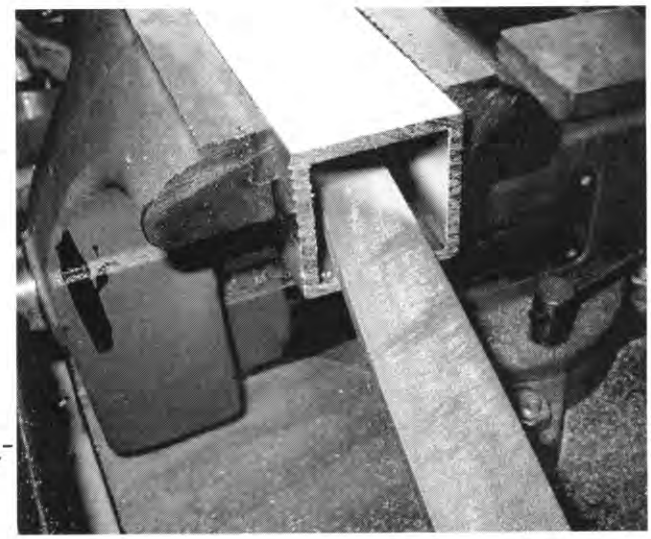




Take your crane apart and head back to the workshop. (Or in my case, the kitchen).

Follow the instructions on cutting metal in the Big Combo Crane section.

Once cut, it's a good idea to mark the two pieces so you'll know for sure that it's THESE TWO bits that go back together. Otherwise, you'll have 4 sections laying at your feet and will be completely confused about what goes where. Do this on all of your cuts.



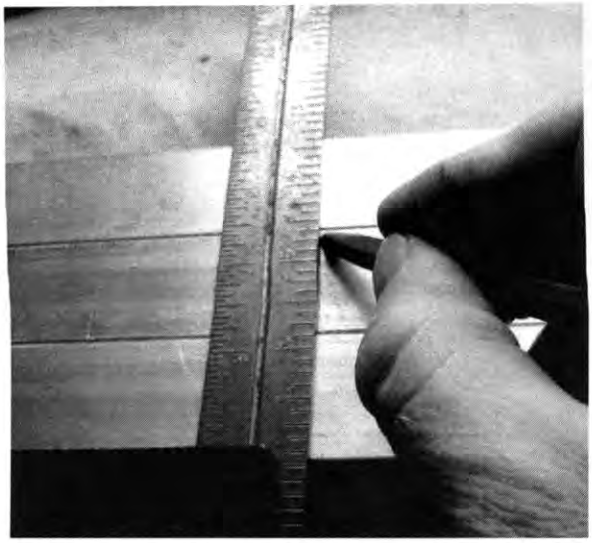
Take a file and file down the inside edges a bit (and while you're at it, smooth out the fresh cut outside edges.) This will make sliding in the bar like butter. If it doesn't slide like butter, do more filing.

Now a word about these bars that hold your crane together.

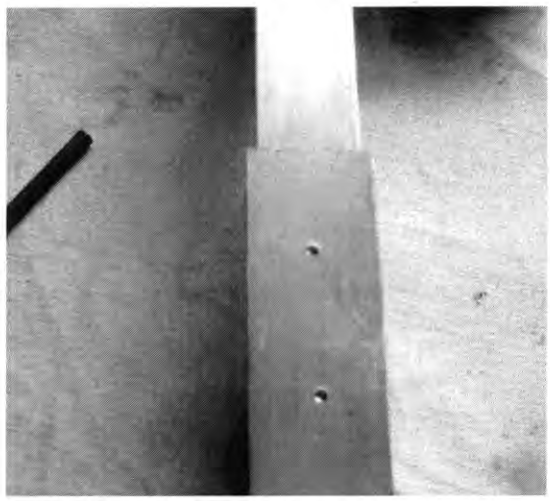
First, they have to fit exactly into the aluminum tube that makes up your boom--with no wiggle room please! (By the way, most people think of "tube" as round stuff. In the metal world, tube is anything that's hollow. So in our case, we're using square tube. Get it? A "bar" is anything that is solid, like square bar or round bar.)

Second, these connector bits don't have to be solid aluminum. 1/8" thick square tube or better will work as long as your support bit slides into the boom arm bit with no wiggle. I prefer the solid, though.

WARNING: You may have to monkey around at the metal supply a bit to find a solid bar that slides into the tube you'll be using as the boom. You ARE ALLOWED TO CHEAT! By that I mean, if you can find two bars when glued together make on perfect bar that slides perfectly into the "boom tube," do it. All you need is some JB Weld to stick those babies together, and by the next morning, you're good to go.



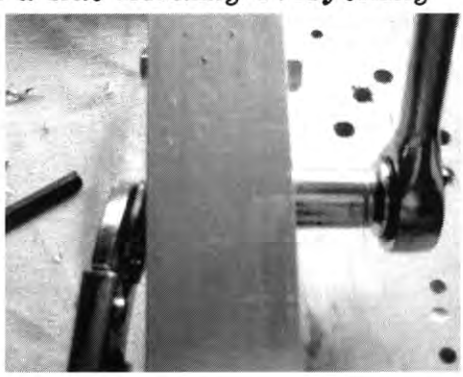
Line up your 12" long bars (were you able to find 12" bars at the metal shop? Most have them. Otherwise you'll have cut them yourself. Not a fun job.) and take your combination square and draw a line across them at six inches.



Take a section of your cut up boom arm and slide the bar into it to the 6" mark you just made. Make a couple of dimples with our prick punch on the boom arm somewhere within the six inch section of the bar. Clamp the bar down so that it doesn't move and drill away with a 1/4" bit (or bigger if you want. Just make sure you have bolts to match). Make sure that you have cutting oil, and keep that bit wet. Drilling through a solid bar takes a little more patience and oil than what you're used to at this point.

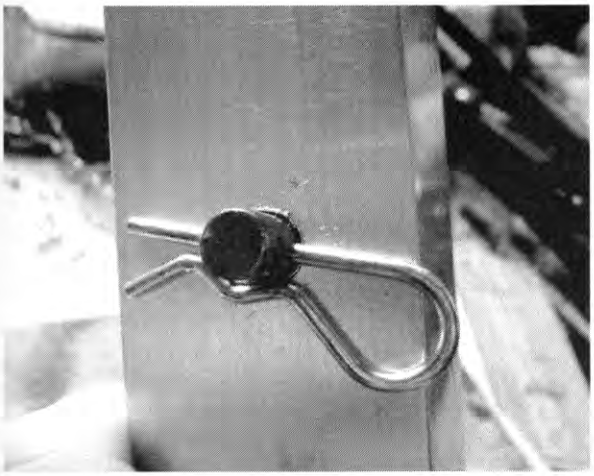


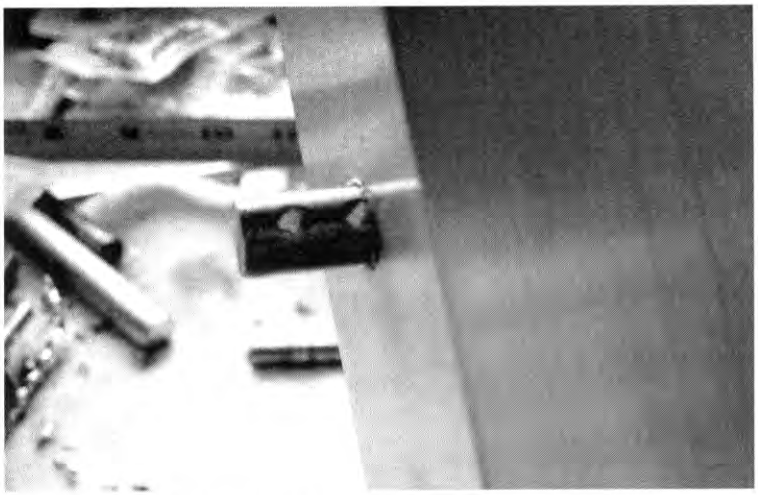
Now, in these holes you just drilled, you'll be putting in bolts with a nut holding everything together. This is the permanent side of our bar, so feel free to use Lok tite or some other nut freezing goop.



Take another piece of boom arm--you know, the one that matches the cut. This should be easy because you marked all of your matching bits, right?--and slide it on to the remaining side of the bar. On this side, just drill one 5/16" hole. Again, make sure the boom arm doesn't move around while you're drilling it.

Take a clevis pin and slide it through that hole, and a hitch pin to hold it there and voila! One solid piece again! Magic, just like David Copperfield.





Shampoo. Rinse. Repeat.

Do this little process on your other cut sections. If you're like me, you'll have 2 more left to do. But you know, you can make just one cut or six. It's entirely up to you. Just remember, the more sections you have in your crane, the more work it is to put together, and well, take apart for that matter.

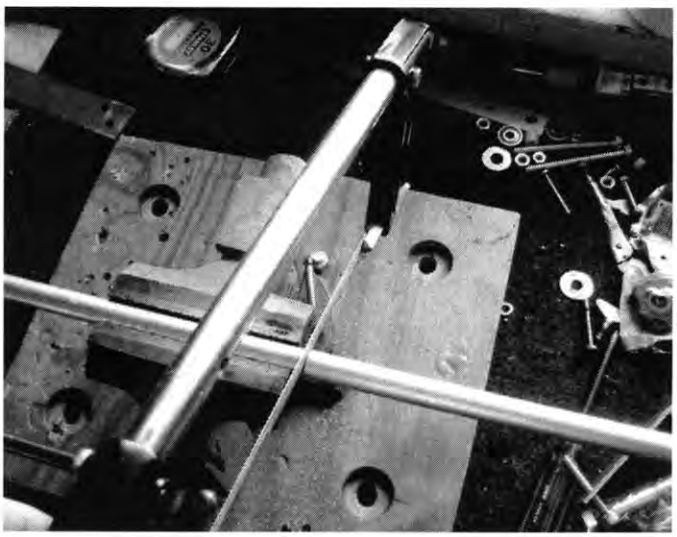


Hey, looky, this length almost reaches the 3rd floor fire escape! Not bad for a 16' crane.

Now for the top control bar.

This is pretty much the same process, except easier.

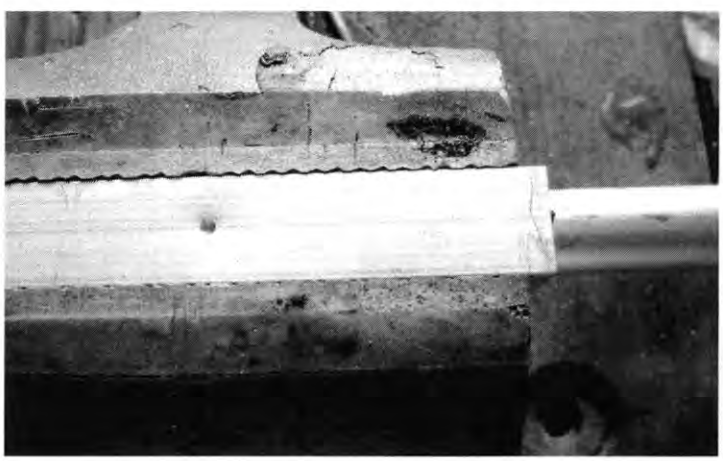
Before we get into it though, let me point out that getting an exact fit of a solid aluminum square bar into a smaller square tube can be tricky. For some reason, these smaller square bars can be hard to find. What is quite easy to find though is a round bar, so that's what we'll be using. Try not to use a round bar as the connector points on the bottom boom arm.



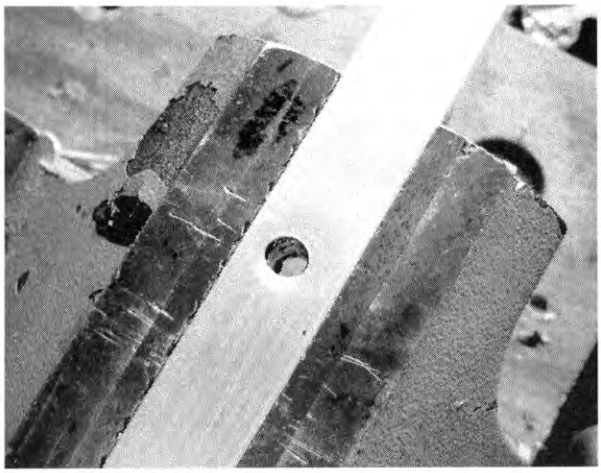
If your bar isn't already 12" long, now is a good time to cut a few lengths.

You also want to cut the top control bar at around the same lengths as the bottom boom arm. Remember to mark the cuts!

Like in the boom arm, slide your bar six inches into the tube. Make a dimple with your prick punch. Unlike the boom arm, this smaller control arm only needs one bolt to hold it. Less work is always a good thing! So drill a 1/4" hole through both the tube and bar at once.

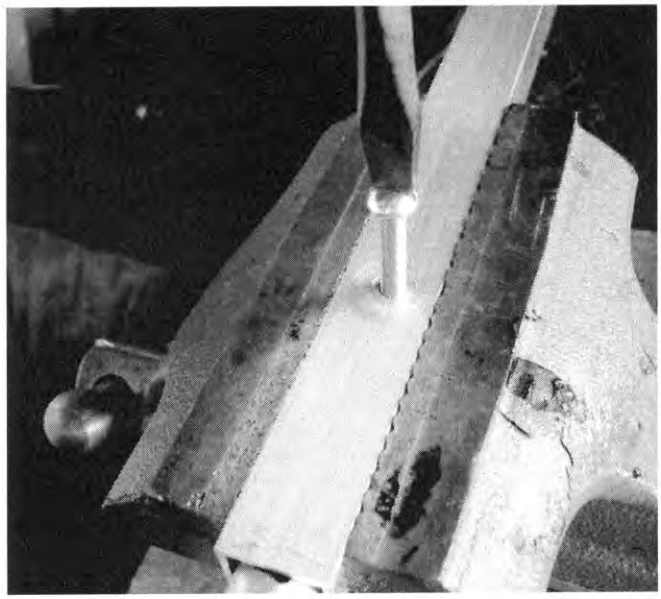


WARNING: If you're using a round bar like me, it will want to rotate when the drill bit hits it. It's a good idea to clamp both the tube and bar so the nothing moves.

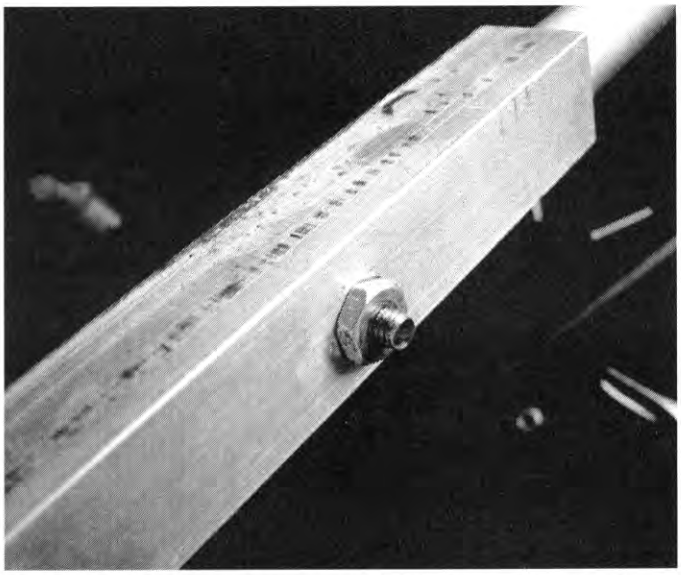


Ohhhh, pretty!

While you have everything all lined up, but a bolt or flat head screw in there.

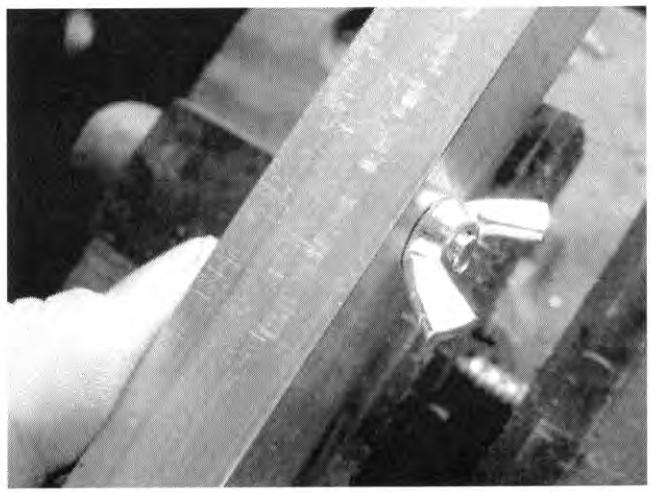


Put a nut on the other side. Add some lok-tite to keep it there.



Repeat the process of drilling the hole and adding a bolt for the other side.

Now this side of the cut needs to come off when we break the rig down, so instead of a regular hex nut, I'm going to put a wing nut for easy Removal.



I could have used a clevis pin here like we did on the boom arm, but I didn't for two reasons: one, it's hard to find a clevis pin this short, so you'd have this long pin sticking out the other side and getting in the way. And two, bolts are a LOT cheaper than clevis pins.

So finish up this process on your other cuts.

Hey, look at that. You're done, unless you want to...

MAKE IT GROOVY

Some of you might have a little trouble keeping your shot smooth through the tilt. Don't worry, help is on the way.

In this section, we'll be adding a couple of springs to help carry the load for us.



Adding this spring is really quite simple. You need a pretty stiff spring around 4" long.

Pull the handle until the vertical bar that connects the control arm with the bottom boom until it is perfectly straight up and down.

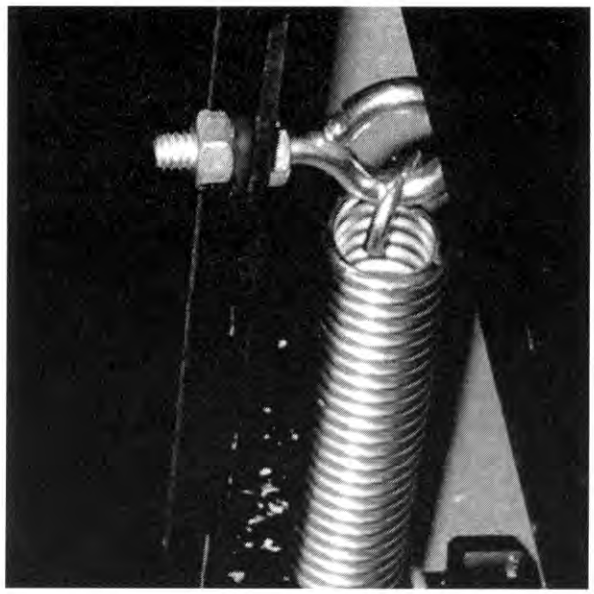
Drill a hole down through the boom a little forward of the vertical bar--toward the camera end. I'm using a 5/16" eye-bolt, so I'm drilling a 5/16" hole.

Add a washer to the eye-bolt and slip it through the hole. Add another washer on the bottom and screw on a stop nut.

Slip the spring on (not such an easy task with a stiff spring. You might need to use vice grips) on to the eye-bolt.



Now we need to figure out where to drill the hole through the vertical bar. Pull the spring up, and find where the top of the spring lands on the middle width of the bar. Drill your hole in the vertical bar a little above where the loop on the spring lands.



Add a nut to the eye-bolt all the way to the top of the threads. Slip it through the hole you just drilled and tighten on another nut to hold the thing.

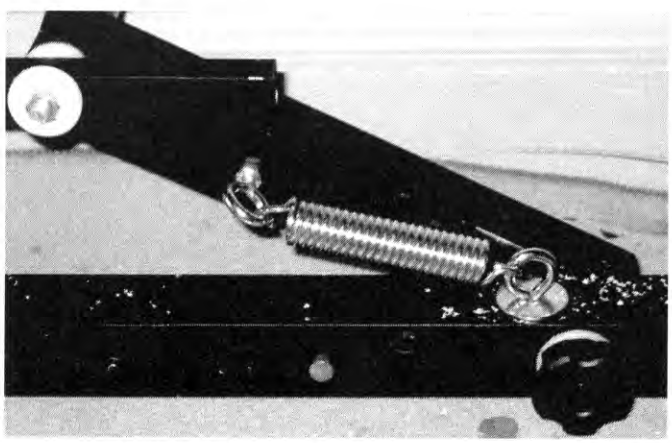
The photo on the right shows the spring all finished and attached to the top eye-bolt.

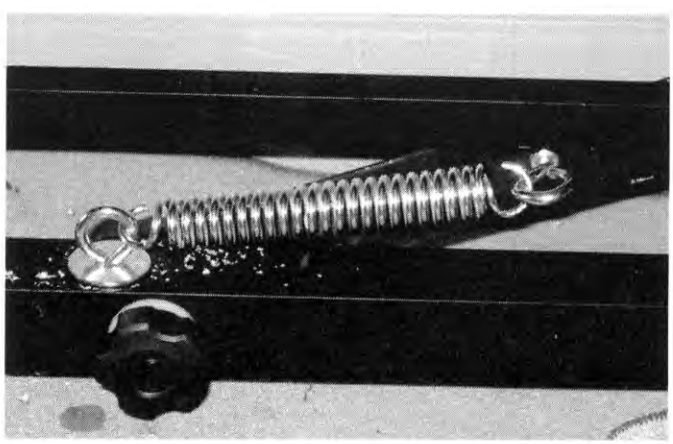
Go to the center vertical bar and repeat the process, EXCEPT DRILL YOUR HOLE IN THE BOTTOM BOOM A **LITTLE BACK TOWARD THE WEIGHT END.**

So to be clear, the bottom eye-bolt next to the handle vertical bar is a little bit forward of the vertical bar, and the eye-bolt next to the middle vertical bar is slightly back from the middle vertical bar.

There. Done.

You might find that sometimes you want to use the rig without the springs. That's fine. Just take vice grips and pry the spring from the top eye-bolt.





PAINTING YOUR RIGS

Painting is pretty easy. Just make sure you take the time to take the rig apart (yes, one more time!) before you go for it. Use a paint that won't reflect light on the set, like flat or satin black. And of course, spray paint makes it much nicer.

Here's what you'll need:



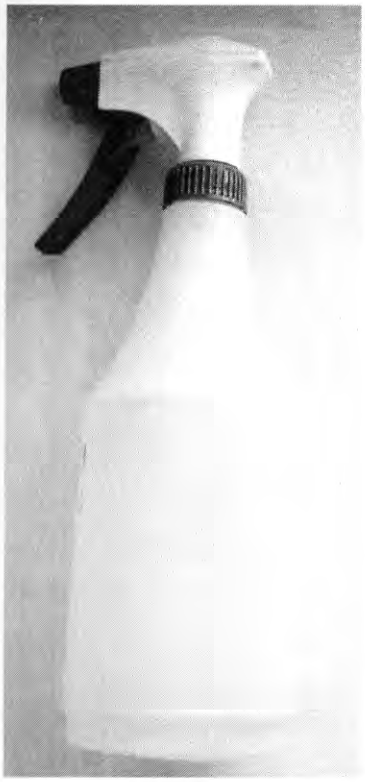
Acetone. Use this to clean off all the grease and oil residue from the metal bits.



Rubber Gloves. The chemicals we're going to use can be pretty nasty, so make sure you pick up a pair.



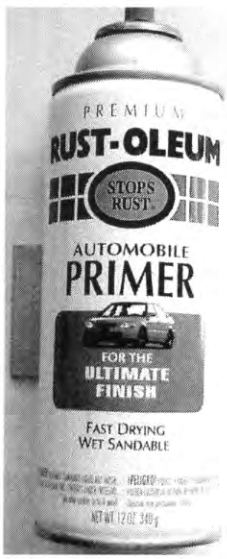
Metal etch. This takes the "edge" off the finish on the aluminum allowing the paint to hold better. If you can't find it, Acetone alone will be OK.



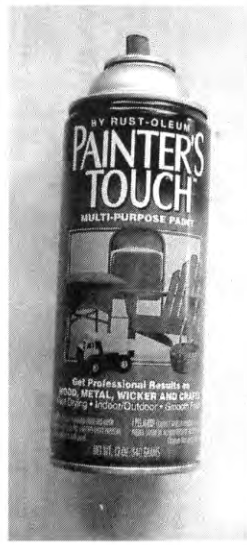
Plastic spray bottle.



A clean, lint free rag.

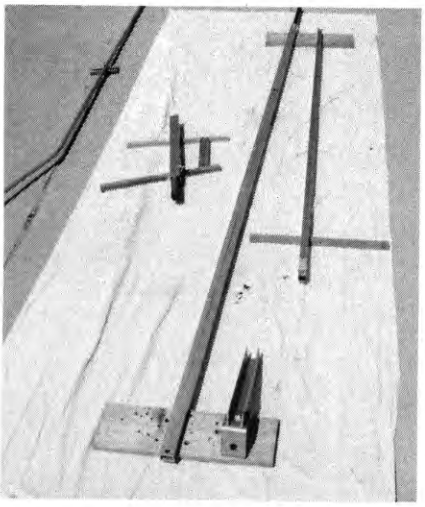


Metal Primer. If you spend a little extra, and the the stuff meant for automotive work, this will give you the best finish.



Spray paint. Get twice as much as you think you need.

Take apart your rig and CLEAN ALL THE PIECES WELL WITH ACETONE. This is very important, or the paint job just won't last.



Lay out your bits on a tarp of newspaper, with wood scraps supporting the ends of the rig bits.

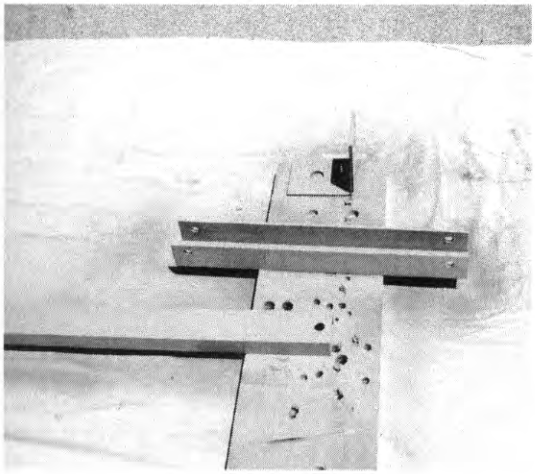
Follow the directions on your metal etch for diluting it. Probably 3:1. Put it in the spray bottle. Make sure you wear your gloves!





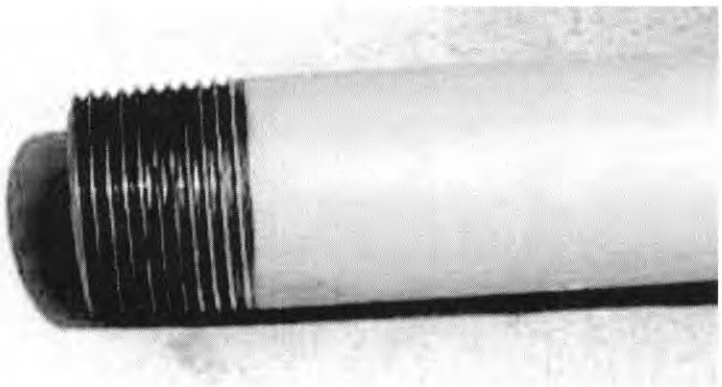
Spray all of your bits down with the metal etch. Let it sit there for a couple of minutes, then take your rag and wipe it off. Make sure you get the etch out of every crack and hard-to-reach spots.





Give each piece a good coat of primer. Do this in 2 light coats to avoid those nasty drips. Read the directions on the spray can about wait time between the first and second coat, and follow them.

Make sure NOT to paint the threads on your crane.





Once the primer is dry, give it 2 or 3 coats of paint. Let it cure, and you're done.

Now put that thing back together and go make a movie.

Things I should have said at the front of this book.

Thanks a million for purchasing this book. I know there are no others like it on the market at this point, but I've tried to write it like I have a ton of competition. I've made every effort to keep the information in this book correct, but this has been one monster project, so some errors might have fallen through the cracks. If you find yourself saying something like "Hey! That squid said to buy a 3" bolt, and I need a 3 1/2 inch! Damn you to hell, Dan!" Please let me know. Also, I've been asked about a vest for the Shock Corridor Stabilizer and about cheap lighting from a large number of you privy to early plans of this book, so yes, **Killer Camera Rigs that You Can Build, Volume II** is in the works.

YOU ARE NOT ALONE!

If you have any trouble with building any rig in this book, I'm here to help. Just e-mail me at:

help!@DVcameraRIGS.com

If you have any questions or comments, I'd love to hear them.

An e-mail would be great:

dan@dvcamerarigs.com

or through the fine U.S. Postal Service

Angel Dog Entertainment
137 N. Larchmont Blvd. #449
Los Angeles, CA 90004

Thanks again, and I hope you'll send me a VHS tape or DVD of your films using some of these rigs.

Sincerely,
Dan Selakovich
Los Angeles, CA



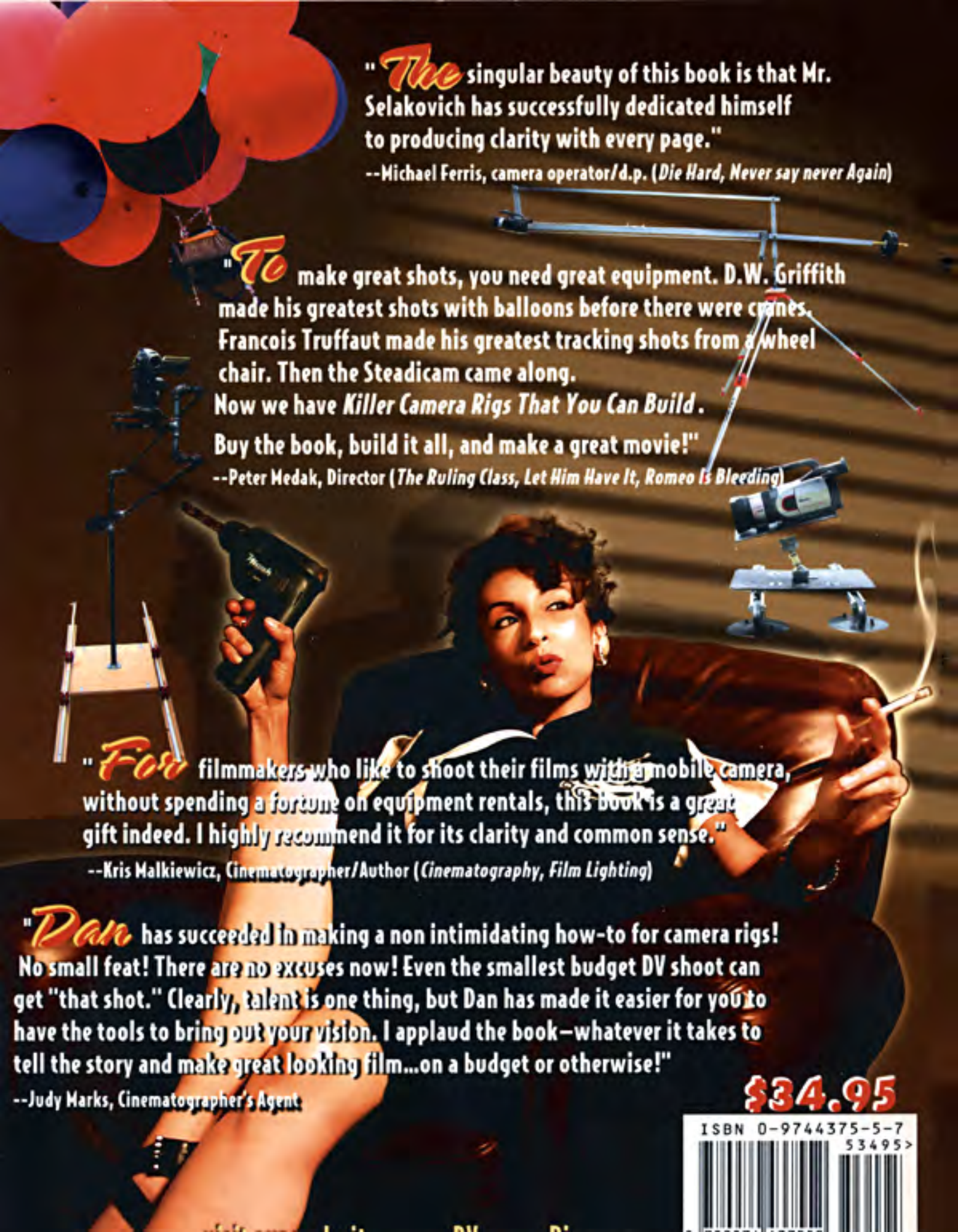
Bio

Dan Selakovich has held almost every position on a variety of film and video projects. Cinematographer, assistant camera, gaffer, grip, boom operator, loader, and since 1986, editor and second unit director. As an editor, Dan acquired the reputation as someone who could "fix" a film in trouble, and found himself working mostly as an uncredited film surgeon making bad films a little more watchable.

In 2000, Dan started writing the book you are now holding. It was a labor of love that took 3 years of success and failure to get it where it is today.

Dan teaches his rig building techniques and designs at the University of Southern California Summer Film Program, giving students the tools they need to give their projects a professional look.

He lives in Los Angeles with his dog, Monk.



"The singular beauty of this book is that Mr. Selakovich has successfully dedicated himself to producing clarity with every page."

--Michael Ferris, camera operator/d.p. (*Die Hard, Never say never Again*)

"To make great shots, you need great equipment. D.W. Griffith made his greatest shots with balloons before there were cranes. Francois Truffaut made his greatest tracking shots from a wheel chair. Then the Steadicam came along.

Now we have *Killer Camera Rigs That You Can Build*.

Buy the book, build it all, and make a great movie!"

--Peter Medak, Director (*The Ruling Class, Let Him Have It, Romeo is Bleeding*)

"For filmmakers who like to shoot their films with a mobile camera, without spending a fortune on equipment rentals, this book is a great gift indeed. I highly recommend it for its clarity and common sense."

--Kris Malkiewicz, Cinematographer/Author (*Cinematography, Film Lighting*)

"Dan has succeeded in making a non intimidating how-to for camera rigs! No small feat! There are no excuses now! Even the smallest budget DV shoot can get "that shot." Clearly, talent is one thing, but Dan has made it easier for you to have the tools to bring out your vision. I applaud the book—whatever it takes to tell the story and make great looking film...on a budget or otherwise!"

--Judy Marks, Cinematographer's Agent

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